PIT AND QUARRY

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PERIODICAL

JUNE, 1941

Agricultural-Limestone Production Methods in Western Kentucky . . . The Lubrication of Pumps . . . Supplying Aggregates and Concrete for Two National Defense Projects

LUDLOW-SAYLOR

CONTROLLED-TEMPER SUPER-LOY WOVEN WIRE SCREENS

for super-severe service

●

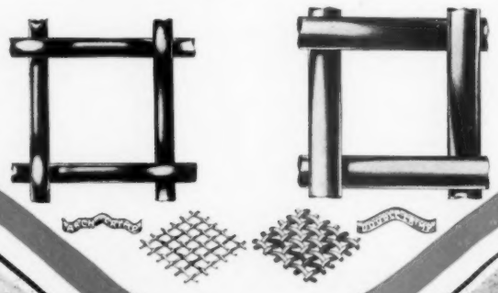
SUPER-HARD, SUPER-TOUGH, SUPER-STRONG

CONTROLLED-TEMPER SUPER-LOY WOVEN WIRE SCREENS

withstand abrasion longer—

endure vibration better—

resist fatigue to the utmost



The background at top of page shows the "Perfect" Double-Crimp Weave.

The small cuts in the center panel compare Arch-Crimp Weave and Double-Crimp Weave.

The border at foot of page shows "Perfect" Double-Crimp Steel Wire Cloth which has been hot-dip galvanized after weaving.

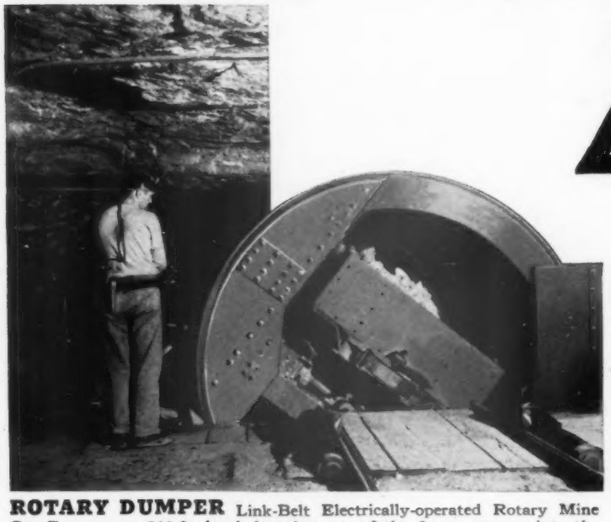
Samples on request.

The LUDLOW-SAYLOR WIRE COMPANY
SAINT LOUIS

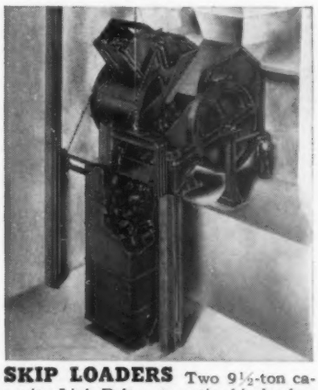
Low-Cost Performance

DETERMINED SELECTION OF LINK-BELT EQUIPMENT

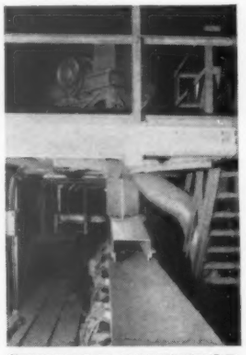
by Union Potash & Chemical Co.



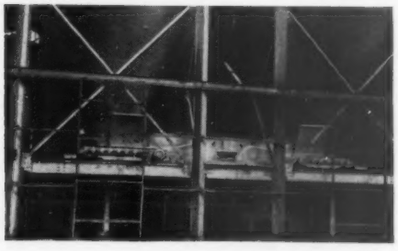
ROTARY DUMPER Link-Belt Electrically-operated Rotary Mine Car Dumper on 900-ft. level dumping one of the 6-ton ore cars into the primary crushing bin and skip loading pocket at No. 1 shaft of Union Potash and Chemical Co.'s mine, Carlsbad, N. M. This dumper is started and automatically slowed down and stopped by push button control.



SKIP LOADERS Two 9½-ton capacity Link-Belt automatic skip loaders of the type illustrated above, assure large hoisting capacities at this mine. These automatic loaders not only cut hoisting costs, but also save through the elimination of the work of cleaning up spillage which usually occurs with the manual loading method.



SHUTTLE CONVEYOR Link-Belt Shuttle Belt Conveyor which receives ore from main storage belt conveyor and discharges to bins in the storage building. This view is taken looking toward one of the discharge ends, directly under the spout to which the main storage belt conveyor delivers material. Head end of main storage belt conveyor is shown at top of the illustration.



PAN FEEDERS Two Link-Belt Pan Feeders handling ore from storage bins to a belt conveyor which delivers to crusher plant.

• The Union Potash & Chemical Co. mine at Carlsbad, N. M. stands today as an excellent example of what is being accomplished in the non-metallic mining field in attaining complete electrification and mechanization.

Being an entirely new mine, mill and power plant, it was but natural for the management to investigate the merits of various equipment to the fullest extent—to find out what equipment would do an outstanding cost-saving job—to look into the performance records of equipment in the mining field.

Pioneers in the development of handling, power transmission and preparation equipment, Link-Belt takes pride in its position today of being able to give sound engineering assistance—to have available a line of equipment to aid in accomplishing mechanized and electrified operation with assured lowest costs.

LINK-BELT COMPANY

Chicago Indianapolis Philadelphia Atlanta
Dallas San Francisco Toronto
Offices and warehouses in principal cities 8540-B

LINK-BELT

HANDLING AND PREPARATION EQUIPMENT

PIT AND QUARRY, June, 1941, Vol. 33, No. 12. Published monthly by the Complete Service Publishing Company, 538 South Clark Street, Chicago, Ill. Subscription price $1 for 1 year in the U. S. and possessions, Canada, Central and South America; elsewhere $1 additional for each year. Single copies 20 cents. Entered as second-class matter February 28, 1932, at the Post Office at Chicago, Ill., under the Act of March 3, 1897.

For low cost per mile

PICK A FORD TRUCK

MANY BIG FLEET OWNERS run their trucks night and day—carrying capacity loads thousands of miles every week of the year.

They watch costs closely. Because the difference of a fraction of a cent per mile, one way or the other, may mean profit or loss.

These operators buy Ford Trucks because they stand up under the grind and save on running time. They buy them for rapid acceleration, for easy handling in traffic and for high speed performance. They buy them for low first cost, low fuel consumption and low cost service. Briefly, *they buy Ford Trucks* for the very things you need in *your* trucks, whether yours is a heavy hauling job or light house-to-house service. Ask your Ford dealer for an "on-your-job" test with *your own* loads and *your own* driver.

FORD TRUCKS
AND COMMERCIAL CARS

MORE TONS PER HOUR
LOWER COST PER TON

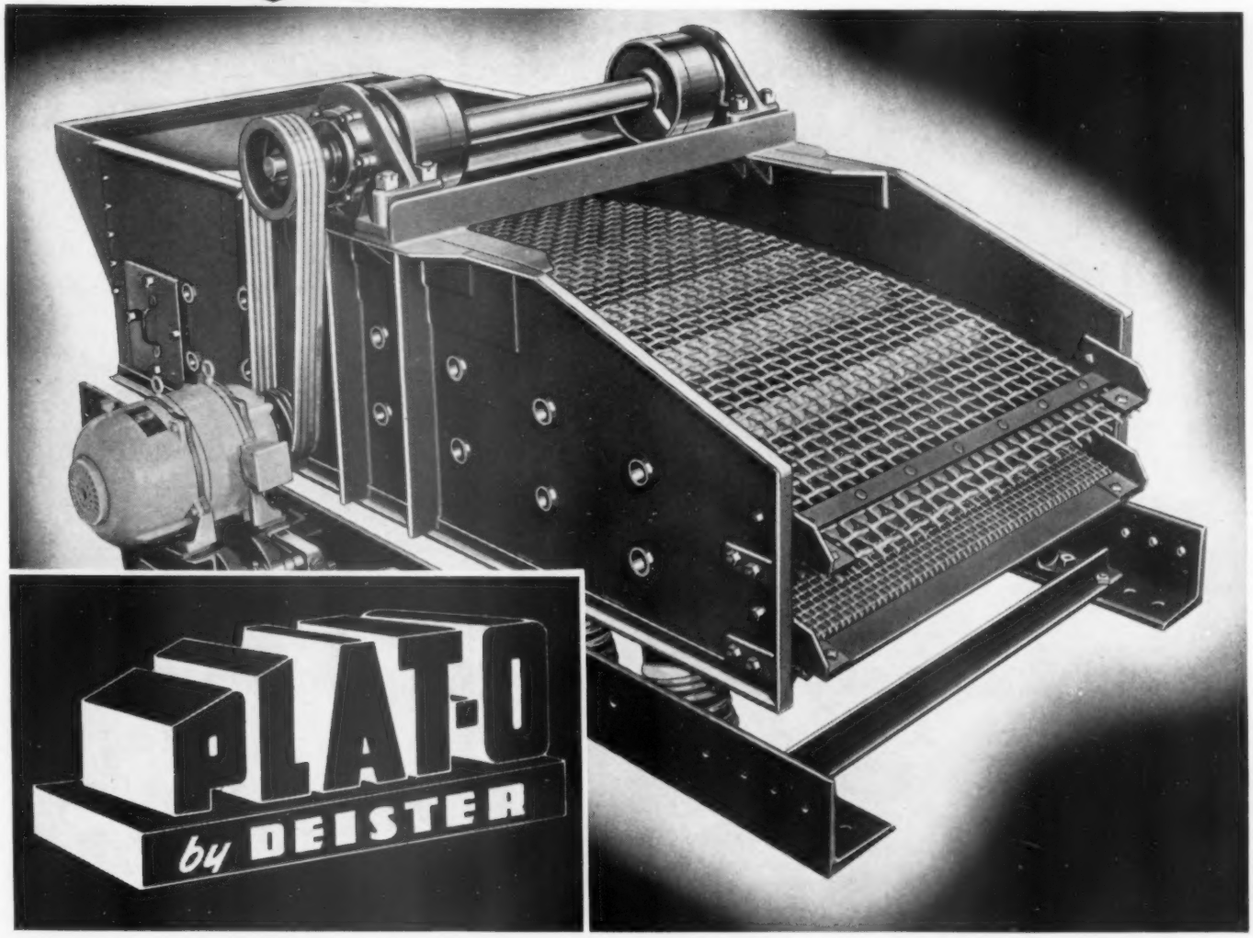
The PLAT-O Vibrating Screen's powerful, positive high speed . . . its opposed elliptical throw, immediately stratifies the load at the feed end of the screen with the result that the undersize is quickly passed through the screen surface . . . extreme oversize is bounced quickly to the far end of the screen. As a result, you can put more material over a PLAT-O Screen—per hour, per day.

Simple design and rugged, all-welded construction with only two bearings and fully cushioned vibration assure you of long-lasting and low-maintenance operation with a Deister PLAT-O Screen. These are only two of the features of PLAT-O Screens that are responsible for producing increased tonnage at a consistently lower cost. Write for the complete story.

DEISTER MACHINE COMPANY
Fort Wayne, Indiana

Write for More Details about these 8 Features:

1. Opposed Elliptical Throw—Low Headroom—Accurate Grading —High Capacity.
2. Adjustable Throw.
3. Powerful Positive High Speed.
4. Oil—Not Grease.
5. Automatic Screen Cloth Tension—each deck independently changed.
6. Vibration Fully Cushioned.
7. Only Two Bearings.
8. Lowest Power Requirements.



The Cedarapids MOROK

The New Super-Quarry Crushing Plant*

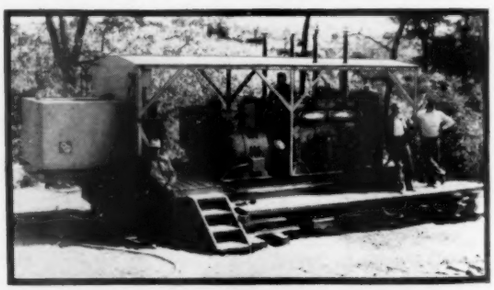
* MEETS THE DEMAND FOR BIGGER CAP
EASY PORTABILITY . . . LOWER PRODUCTI

The Cedarapids "Morok", the only plant of its kind in the industry today, meets the demand for big tonnage at low cost. Large construction projects requiring thousands of tons of aggregate must have material without delay. In one operation, from quarried rock to delivery trucks, the Cedarapids "Morok" delivers crushed, screened and graded aggregate at from 150 to 200 tons per hour.

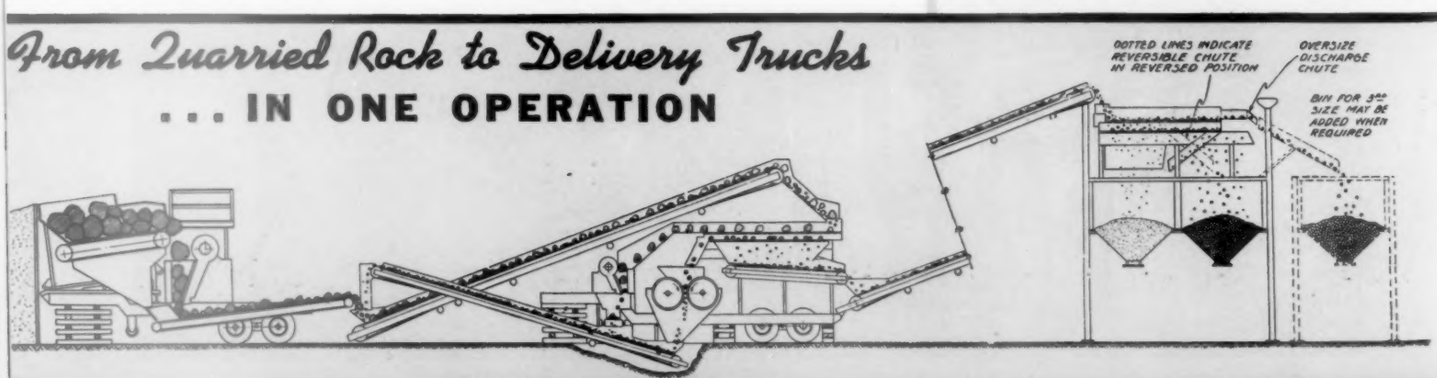
The Cedarapids "Morok" is completely portable. Each unit is mounted on its own tractor-trailer ready to be pulled to the job. Setting-up and dismantling time is reduced to the minimum.

Your Only Competitor Is Another "Morok" Owner!

ALL ELECTRIC



From Quarried Rock to Delivery Trucks
. . . IN ONE OPERATION


DOTTED LINES INDICATE REVERSIBLE CHUTE IN REVERSED POSITION
OVERSIZE DISCHARGE CHUTE
BIN FOR 3RD SIZE MAY BE ADDED WHEN REQUIRED

IOWA MANUFACTURING COMPANY

ARACITY . .
CTON COST

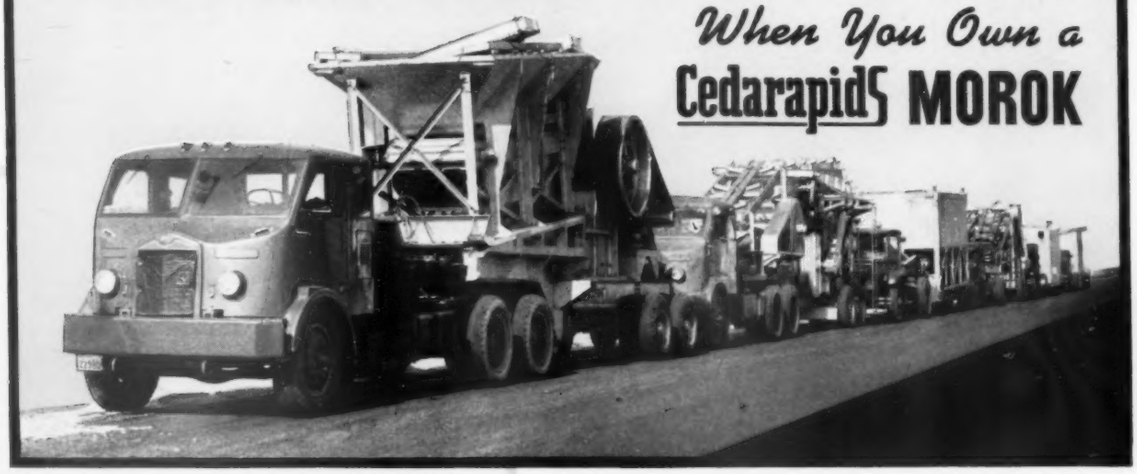
RIC POWER

The Cedarapids "Morok" may be powered by separate electric motors for each crusher screen and conveyor. Electricity may be provided by special generator or from high lines. Switches may be mounted on one panel for centralized control.

YOU CAN TAKE IT WITH YOU

When You Own a

Cedarapids MOROK



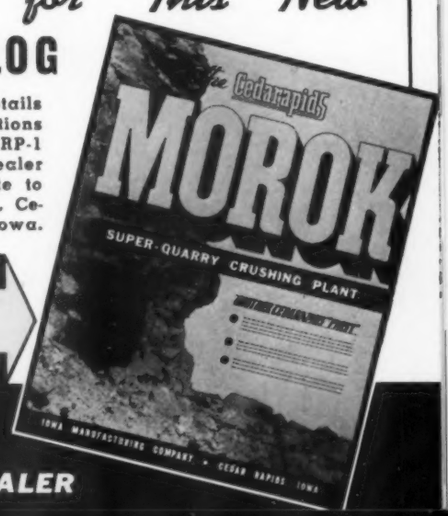
OR DIESEL PLUS ELECTRIC

An alternate power set-up is a combination of separate diesel motors for the primary crusher and the secondary crushers with electric motors for screens and conveyors. A small generator furnishes electricity for these motors.

Send for This New

CATALOG

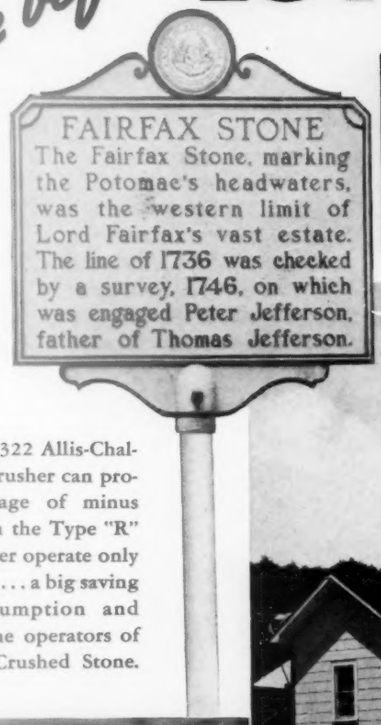
For further details and specifications get bulletin SRP-1 from your dealer today or write to Iowa Mfg. Co., Cedar Rapids, Iowa.



Cedar Rapids, Iowa . . *SEE YOUR CEDARAPIDS DEALER*

Where history was made before

LOW COST TYPE "R" NEW RECORDS


FAIRFAX STONE
The Fairfax Stone, marking the Potomac's headwaters, was the western limit of Lord Fairfax's vast estate. The line of 1736 was checked by a survey, 1746, on which was engaged Peter Jefferson, father of Thomas Jefferson.

Because the No. 322 Allis-Chalmers Type "R" Crusher can produce large tonnage of minus 3/8" product, both the Type "R" and the roll crusher operate only three hours a day... a big saving in power consumption and man hours for the operators of Fairfax Sand & Crushed Stone.

Let ALLIS-CHALMERS COOPERATIVE

CRUSHER SETS FOR PRODUCTION EFFICIENCY!

Fairfax Sand & Crushed Stone Co., Thomas, W. Va., Increases Capacity 50%... Slashes Operating Costs! Here's a Typical Example of How Allis-Chalmers Cooperative Engineering Works.

A member of the West Virginia Senate for 24 years, the Honorable Abraham Lincoln Helmick is an able business man as well . . . proved by the profit statement of Fairfax Sand & Crushed Stone Co.

On the site of historic Fairfax Stone, the Honorable Abraham Lincoln Helmick, dean of the West Virginia Senate, is making profits in a crushed stone plant that operated at a loss for many years before.

Chief products are railroad engine sand and concrete sand, which formerly were made by passing sandstone directly from a 6″ gyratory crusher to a roll crusher. But over-size pieces quickly grooved to roll faces . . . caused over-size material to pass through the rolls and over the scalping screen as waste for which there was no market.

Then Senator Helmick took over, called in Allis-Chalmers engineers to cooperate with him on a modernization program.

Increases Capacity 50%!

By installing a new No. 322 Type "R" Crusher ahead of the roll crusher, they not only eliminated the high percentage of waste and saved the cost of grinding the crushing rolls periodically... but capacity was increased 50%...operating time of the roll crusher cut from eight to three hours a day! In 1940 Fairfax Sand & Crushed Stone showed a profit for the first time in many years!

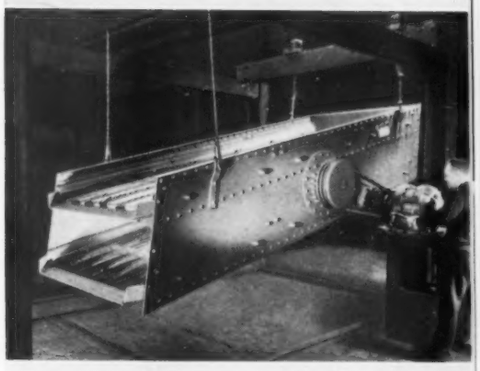
That's why Senator Helmick recently gave Allis-Chalmers the order for three modern vibrating screens and a double screw sand washer to replace outmoded equipment—made his plant 100% Allis-Chalmers-equipped!

And that's why, when a production problem comes up in your plant, you'll find it pays to call on Allis-Chalmers. Working with your own engineers, we bring the tremendous inter-related experience of the world's largest manufacturer of rock and ore reduction machinery to bear on your individual problems.

This is our cooperative engineering service. Why not let us show you how it can help you save production dollars? Write Allis-Chalmers, Milwaukee, Wisconsin. A1398

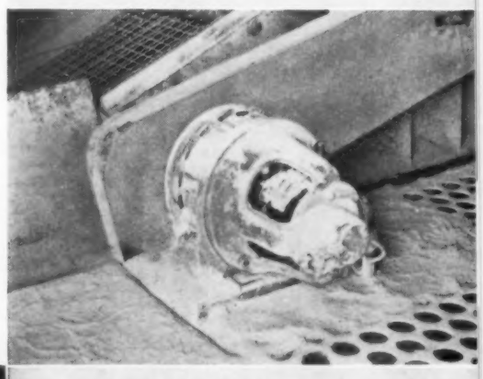
ENGINEERING *Cut your costs*

News of other Allis-Chalmers Products that cut your costs!



SMOOTHER OPERATION...INCREASED efficiency... reduced power and maintenance costs — that's what you get with the New Allis-Chalmers Ripl-Flo Screen with uniform circle throw.

THE NEW, LARGER SIZE NO. 636 TYPE "R" Crusher allows more operators to take advantage of the big savings of "Speed-Set" Control. A turn of the hand crank gives instant change of product size.



"I'M TOUGH ON MOTORS!" THAT'S what E. H. Humberstone, Superintendent, Marble Cliffs Quarries Co., Columbus, Ohio, says. That's why he uses Allis-Chalmers Lo-Maintenance Motors — 187 of them like the 10 hp motor shown here on which not one cent has been spent for repairs in 15 years.

ATLAS MANASITE DETONATORS

Another "ATLAS FIRST"

Some People always question Progress

FROM the steamboat to the stratoliner... from the pony express to the radio... progress has never gone unquestioned. People scoffed at Fulton, they laughed at Edison.

Atlas Manasite Detonators—a great step forward in safer blasting—have been no exception. Some people at first hesitated to use them. Yet—more and more blasters are using Atlas Manasite Detonators. Once they try them, blasters like the dependability of Atlas Manasite Detonators. Reorders and new orders tell the story—over 100,000,000 already have been used.

Atlas Manasite Detonators offer an increased margin of safety . . . with no sacrifice in detonating efficiency, and at no increase in cost. Safety precautions become, not less important, but more effective.

Are you using this advance in greater safety?

ATLAS EXPLOSIVES *"Everything for Blasting"*

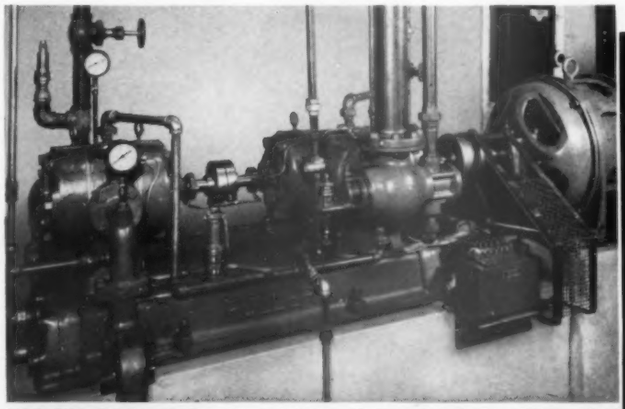
CHEMICALS ATLAS EXPLOSIVES

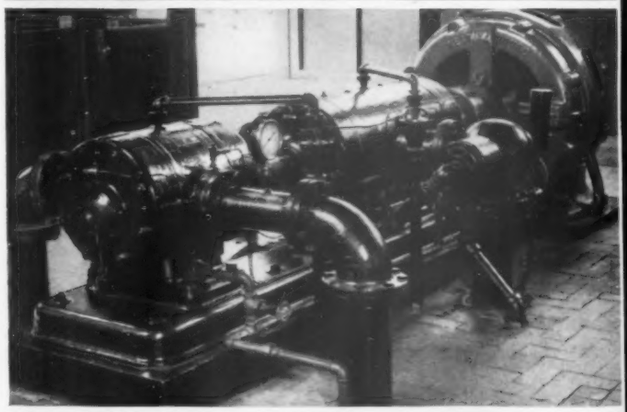
ATLAS POWDER COMPANY, Wilmington, Del. • Offices in principal cities • Cable Address—Atpowco

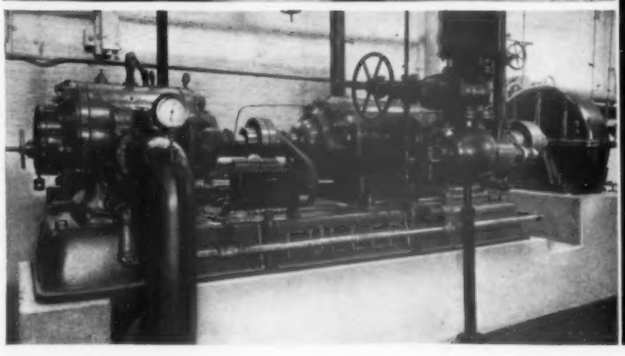
Built for TROUBLE-FREE operation

Rush! Rush! Rush! More speed all along the line. That's the cry today. But speed is not enough . . . equipment must be able to stand up under the most severe operating conditions . . . service must not be interrupted. Breakdowns—delays—time out —all mean loss of vital production and money out of pocket.

With this thought uppermost, only the best of materials and workmanship go into the makeup of Fuller Rotary Compressors. They're built for trouble-free operation and performance records prove them to be just that. When, after long, gruelling operating periods, inspection and check-up is desired, the machine design permits doing this quickly and easily.







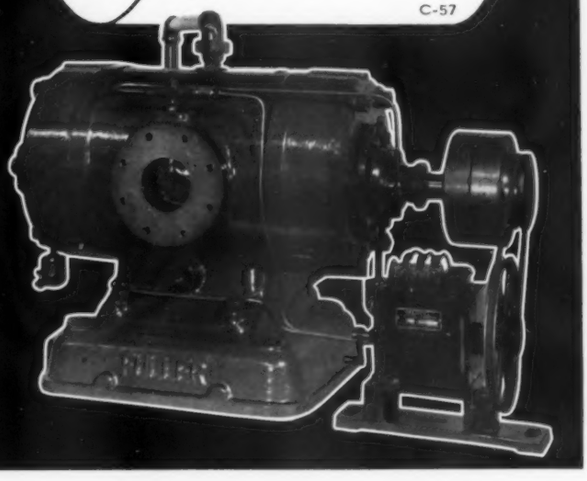
FULLER ROTARY COMPRESSORS

- Direct drive
- Easy to operate
- Low maintenance
- Simple foundations
- No bearing take-up
- Small space required
- No air-line pulsations
- Parts readily accessible
- Sturdy yet light in weight
- Blades automatically compensate for wear
- No valves to leak or seats to grind
- Unnecessary bulk eliminated
- Maintained capacities for the life of the machine
- No multiplicity of parts requiring frequent attention and replacement

BUILT FOR ANY PRESSURE TO 125-LB.

FULLER COMPANY
CATASAUQUA, PENNA.
Chicago: 1118 Marquette Bldg.
San Francisco: 320-321 Chancery Bldg.

C-57



155 YARDS OF SILICA ROCK PER HOUR AT HIS FINGERTIPS

A finger moves, the dipper responds instantly, smoothly, accurately — and another load is on it's way. It's just as easy as that, with Bucyrus-Erie control. Operators all over the country find that with Bucyrus-Eries, fighting takes place at the dipper teeth and not at the levers. Not only is the action at the controls almost effortless but the maintenance, too, is negligible. Machinery is simple and accessible; brake or clutch adjustment is made quickly, easily — and stays put regardless of temperature change! Bucyrus-Erie has always specialized in solving the operator's problems because here begins the machine's ability to produce. This unposed action photograph of Robert Sidley's 20-B at Thompson, Ohio, proves that operator has at his fingertips smooth, instant action and consistently high output.

BUCYRUS ERIE

Bucyrus·Erie

SOUTH MILWAUKEE, WISCONSIN

CEMENT . . Bulwark of National Defense

National defense works are creating a terrific demand for permanent construction . . . cement, sand, gravel, crushed stone, lime, gypsum, etc. To get them out of the ground and process them in the quantities necessary, producers of these materials need much additional machinery and equipment.

Tell these buyers about your products... through Pit and Quarry.

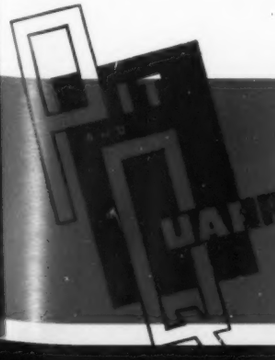
Each year for more than a decade Pit and Quarry has published a Special Cement-Mills Edition in July and the industry has come to look forward to these issues with anticipation because of their apt portrayal of current developments.

The July, 1941, Annual Cement-Mills Number presents an exceptional advertising opportunity to those seeking to sell the cement industry in particular, and the entire pit-and-quarry field in general. Extra reader interest and extra circulation are guaranteed.

Pit and Quarry is the accepted leader in its field . . . FIRST in advertising volume . . . FIRST in circulation coverage and penetration . . . FIRST in reader preference. Ask to see a copy of an impartial readership study conducted by a nationally-known independent research organization.

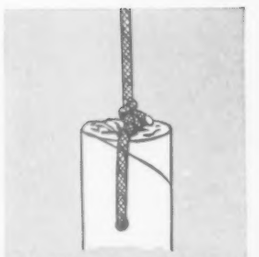
A $600,000,000 INDUSTRY

The 160 Portland-cement plants in the United States represent a capital investment of $600,000,000. The 1940 output was valued at about $200,000,000. Purchases for equipment replacement, fuels, supplies, etc., exceed $75,000,000 a year. Pay-rolls average about $35,000,000 annually.

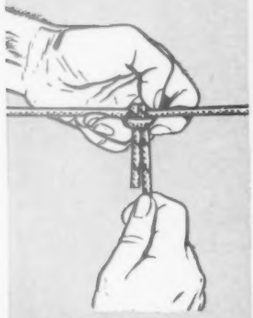


PIT and QUARRY

538 South Clark St. Chicago

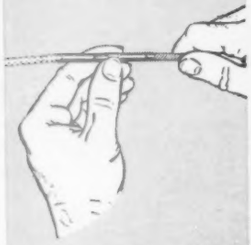


1. Tie through cartridge.



2. Half hitch branch to main line.

3. Connect main line lengths with *square* knot.



4. Fuse and cap on end of main line.

IMPORTANT

Branch lines should lead away from main lines at *right angles*. Avoid kinks and small loops.

For Better Fragmentation

It's cheaper to break up the stone in the original blast than it is to mud cap later on. Users of Primacord claim better fragmentation because: (1) Primacord, by acting as the detonating agent for each cartridge in the hole, gets more work out of the explosives. (2) While the detonating wave travels at a speed of nearly four miles per second, it is possible to plan the firing of successive holes and rows of holes to permit relief of burden. Send for the Primacord Book.

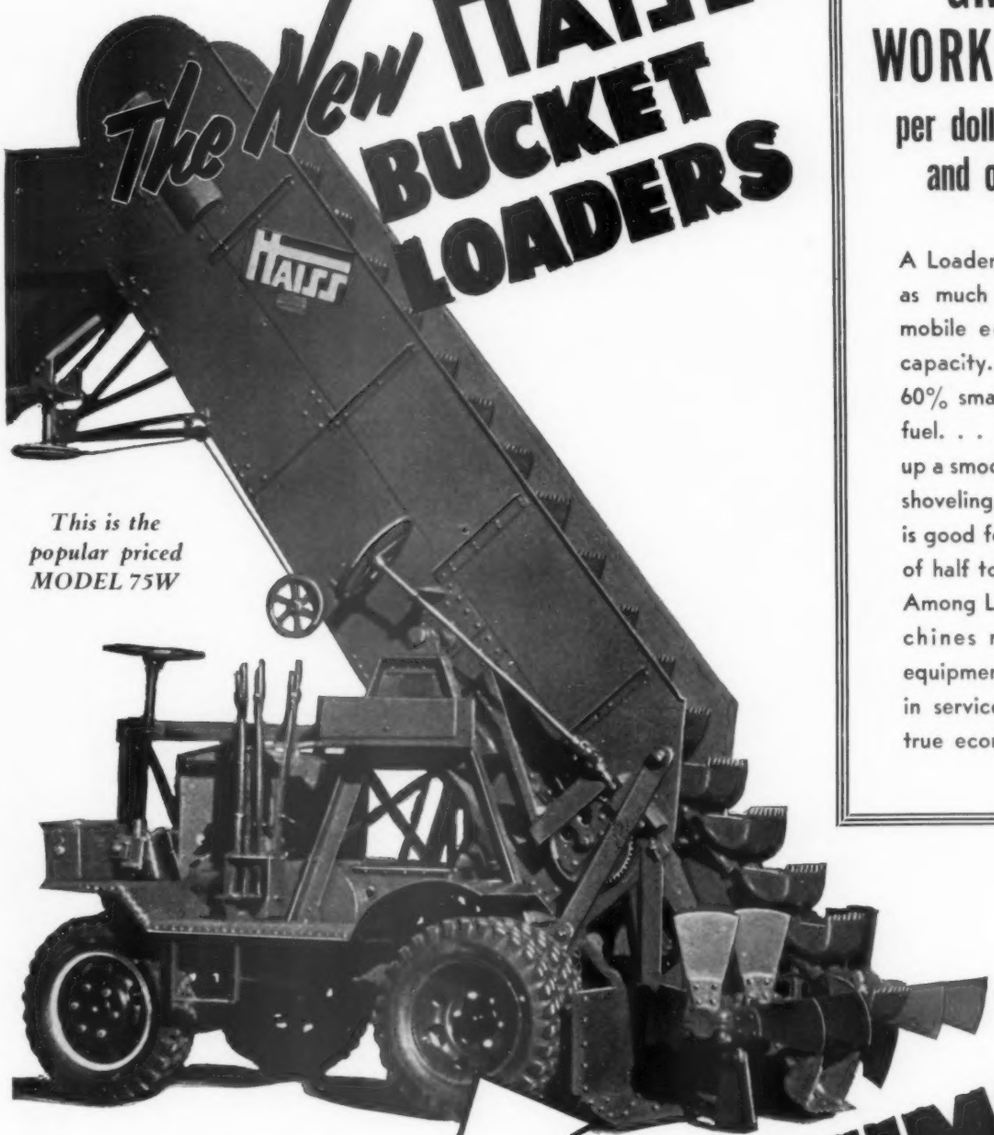
PB-33

PRIMACORD BICKFORD
Detonating Fuse

THE ENSIGN-BICKFORD COMPANY • SIMSBURY, CONN.

Makers of Cordeau-Bickford Detonating Fuse — and Safety Fuse since 1836

The New HAISS BUCKET LOADERS



This is the popular priced MODEL 75W

GREATEST WORK CAPACITY

per dollar of ownership and operating cost

A Loader costs only 1/3 to 1/2 as much as any other type mobile equipment of equal capacity. . . . It uses a 40 to 60% smaller engine—and less fuel. . . . It levels and cleans up a smooth floor without hand shoveling. . . . A Haiss Loader is good for a lifetime capacity of half to a million yards. . . . Among Loaders the Haiss machines rate as heavy-duty equipment, designed to excel in service. Therein lies their true economy. Interested?

MODEL 75W—2½ to 3 cu. yds. per min.

MODEL 77W—Heavier duty, same capacity.

MODEL 80W—3 to 5 cu. yds. per min.

MODEL 135—(Creepers) 5 to 8 yds. per min.

ON PNEUMATIC TIRES

Something TO FIND OUT ABOUT!

Please send me your general Loader Bulletin 539 together with details and prices on models .....

Name of Individual .....

Name of Company .....

Street & No. .....

City & State .....

GEORGE HAISS MANUFACTURING CO., INC.

142 STREET AND RIDER AVENUE, NEW YORK, N. Y.

IT'S THE SWING TIME THAT COUNTS

KOEHRING LONGER RADIUS...BIGGER CLEAN-UP AREA...CUTS SWING TIME

Saving swing time in shovel operation . . . multiplied hundreds of times each shift ...is the sure way to increase production... and increase the profit. Koehring longer radius for clean-up gives you a bigger clean-up area...permits the hauling unit to be spotted farther into the cut...closer to the dipper...*reduces swing time*...and it's the swing time that counts! Be sure the next shovel you buy has this important time-saving advantage...Buy a Koehring!

Check the large clean-up area of the Koehring Shovel...It saves swing time and increases your production-profit.

KOEHRING COMPANY
MILWAUKEE • WISCONSIN

KOEHRING HEAVY DUTY

HEAVY-DUTY CONSTRUCTION EQUIPMENT

THIS SMART OPERATOR SELLS 100% OF HIS PRODUCT

— because his plant can now supply smaller sizes of crushed stone demanded by changing specifications

TELSMITH
Intercone Crusher

The Crystal Lake Crushed Stone Co., Sheboygan, Wis., found that 20% to 30% of their product went to the stockpile instead of to market. The reason? Changes in specifications had created a market demand for smaller-sized stone. There was little demand for these coarser sizes.

Early in July, 1940, a Telsmith Intercone Crusher was installed. They're selling 100% of their product now. The Intercone is crushing down to the sizes the market uses. It has increased by 50% the plant's capacity for plus 1/8" to minus 3/8" stone chips. The product is finer and better, too. The output of torpedo sand is increased, and its quality improved on account of its larger content of stone particles.

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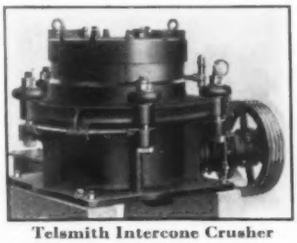

Telsmith Intercone Crusher

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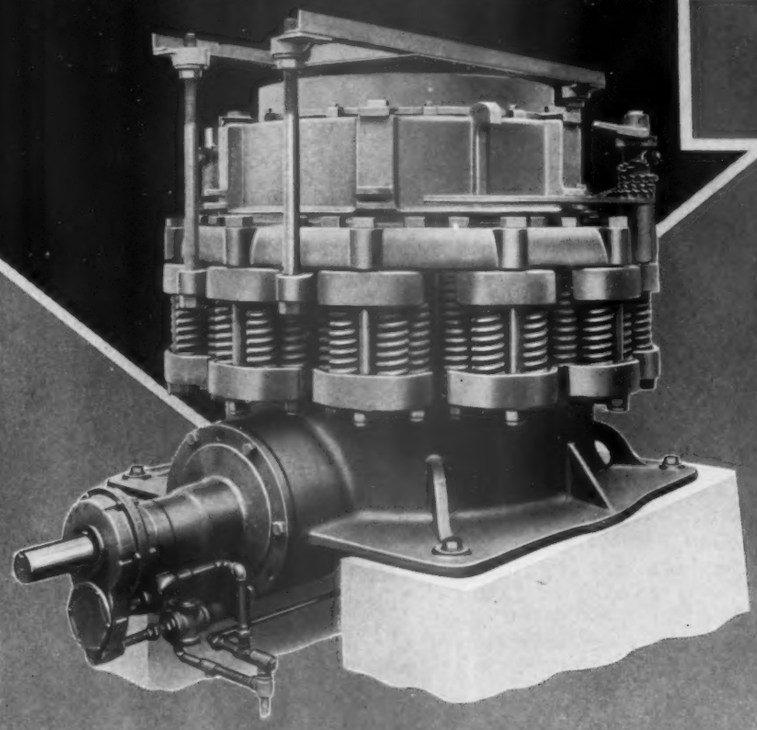

● The superiority of the Symons Short Head Cone Crusher for making minus ½ inch and even minus ¼ sizes is evidenced by this partial list of installations in this country in the non-metallic field alone. More and more producers of stone, gravel, slag, cement and other industrial minerals, have found that this Crusher will produce in greater quantity and at a lower cost than any other type of equipment used for a similar service. In many instances, the Short Head follows a Symons Standard Cone. By the installation of this Crusher, the increasing demand for finer materials can be met and produced at greater profit.

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Blue Ridge Stone Corp.	4′
Samuel Braens & Sons	4′
Buffalo Slag Co.	4′
Burton Brothers	3′
Carnegie-Illinois Steel Corp.	3′
Cleveland Slag Co.	Two 3′
Columbia Construction Co.	4′
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Crawfordsville Shale Brick Co.	3′
Dolite Co.	4′
John T. Dyer Quarry Co.	4′
E. P. Ellis	3′
Genessee Stone Products Corp.	3′
Honolulu Construction & Draying Co.	3′
Hopkinsville Stone Co.	3′
Kanawha Sand & Gravel Co.	3′
John W. Karch Stone Co.	Two 3′
Kelley Island Lime & Transport Co.	4′
John S. Lane & Son, Inc.	3′
Lone Jack Limestone Co.	4′
Louisville Cement Co.	4′
Marble Cliff Quarries Co.	5½′
Marquette Cement Mfg. Co.	4′
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Newton County Stone Co.	Three 3′
New York Trap Rock Corp.	4′
Ohio Blue Limestone Co.	4′
Ohio Gravel Co.	3′
Ohio Quartz Products Co.	3′
Orford Soap Co.	Two 3′
Pembroke Limestone Corp.	3′
Pennington Trap Rock Co.	4′
Permanente Corporation	5½′
Pompton Crushed Stone Co.	3′
Pounding Mill Quarry Corp.	3′
Raleigh Granite Co.	3′
Ridge Township Quarry	3′
Rockydale Quarries Corp.	3′
Standard Lime & Stone Co.	4′
Standard Slag Co.	Three 3′
Staso Milling Co.	4′
Sturgeon Bay Co.	4′
Suffern Stone Co.	3′
A. Teichert & Son, Inc.	4′
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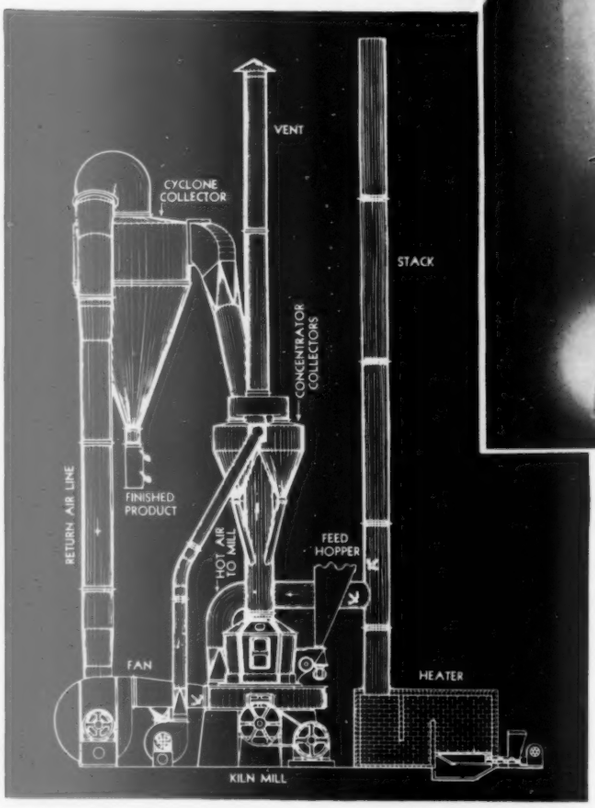
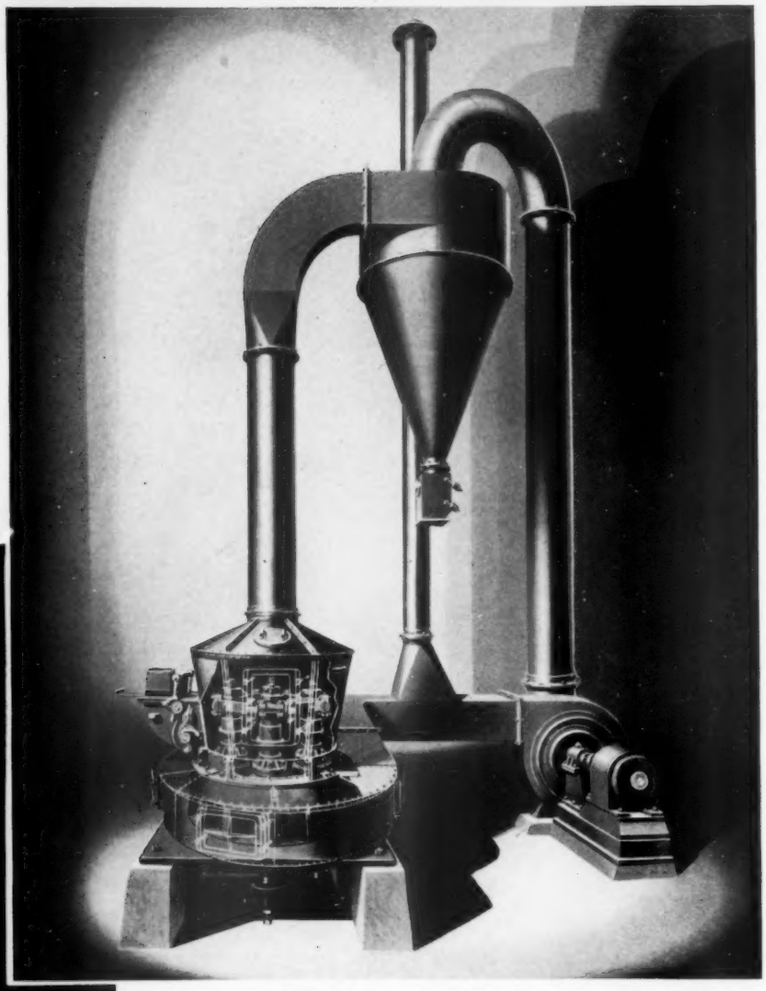


Flow sheet showing Low Side Roller Mill equipped with air-drying system for removing small percentages of moisture in grinding gypsum, limestone, etc.



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PIT AND QUARRY

Vol. 33 JUNE, 1941 No. 12

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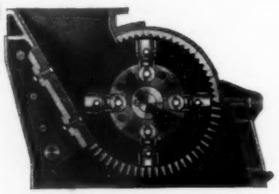

Cross Section View of Pulverizer.

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PIT AND QUARRY

CHICAGO JUNE, 1941

Report Ash Grove to Build Cement Plant at Beaumont, Texas

It is reported that the board of directors of the Ash Grove Lime & Portland Cement Company have authorized the construction of a new Portland Cement plant at Beaumont, Texas. L. T. Sunderland, president, and Guy Gardner, superintendent of the company's Chanute, Kan., plant, were in Beaumont a few weeks ago and are said to have acquired a site adjoining the Magnolia Oil Company refinery. The company is also reported to be considering the erection of a lime plant there.

Another prospective Beaumont plant will be the paper-pulp mill of the Western Cartridge Company. This will include a lime plant with a capacity of about 180 tons per day.

Fire Causes $40,000 Damage near Boston

Fire caused $40,000 damage when it destroyed the screening building and three trucks at the plant of the Lexington Sand & Gravel Company near Boston in April.

A violent explosion accompanied the blaze when the fire reached a gasoline-storage tank.

Heart Attack Fatal to Charles Freiberg

Charles A. Freiberg, 53, who rose from office boy to general manager of a Buffalo cement company, died suddenly of a heart attack at his home in Buffalo May 5.

Mr. Freiberg was compelled by the death of his father to start work at the age of 13. He rose steadily in the cement company and in 1919 was elected president of the old Amherst Stone Company.

He was active in the political life of Buffalo and Erie County for nearly a quarter of a century. He was elected to the State Assembly four times and also served in the State Senate. He also served as sheriff of Erie County.

Installs Facilities to Produce "Dry Ice"

The Calera Lime Corporation is rehabilitating the old plant of the Alabama Lime & Stone Corporation at Calera which has been idle for years. Lime will be produced and a dry-ice plant is being installed. E. T. Schuler is president of the company, R. E. Schuler is secretary and J. R. Phillips is general superintendent.

Lehigh Builds Packing Plant in Spokane

Construction has begun at Spokane, Washington on a new storage and distributing plant for the Lehigh Portland Cement Company to cost $60,000.

Storage facilities are to consist of five reinforced-concrete silos 16 feet in diameter and 50 feet high. The packing plant will be two stories high and 30 by 30 feet in size. A 30- by 100-foot warehouse is also being constructed. The work is being done under the supervision of A. I. Dehuff of the Lehigh Metaline Falls plant.

Coming Events

June 19-20, 1941—Hot Springs, Virginia. Sixth annual convention, National Industrial Sand Association.

June 25, 1941—Chicago. Semi-annual meeting, board of directors, National Ready Mixed Concrete Association, Palmer House.

June 23-27, 1941—Chicago. Annual meeting, American Society for Testing Materials, Palmer House.

Wage Increase Averts Threatened Strike of 10,000 Workers

Granting of wage increases by two major cement companies was reported to have averted a threatened strike of 10,000 cement workers at Bath, Pensylvania, which would have tied up vitally important defense orders in a four-state area.

It was announced that an agreement signed by officials of the Lehigh Portland Cement Company, the Alpha Portland Cement Company, and the United Cement, Lime and Gypsum Workers Union (A.F.L.) would increase the basic wage rates in that area from 57 cents to 65 cents an hour.

"The possibility of a general strike in the cement industry in this area is over," Samuel R. Diskan, vice-president of the union, said. "The 15 other major cement companies throughout Pennsylvania, New York, New Jersey and Maryland have promised to sign similar agreements," he said.

Florida Operator Hurt in Air-Liner Crash

H. E. Post, general manager of the Seminole Rock & Sand Company, Miami, Florida, was one of the passengers on the Eastern Air Lines plane which crashed in a swamp near Vero Beach, Florida, in April. Although one of the most severely injured of the 13 passengers and 3 crew members with a broken leg, Mr. Post offered others his place in the rescue boat after 10 hours in the half-submerged cabin of the plane.

H. E. Post.

A violent windstorm unroofed the lime plant of the Marblehead Lime Company at Quincy, Illinois recently.

Middle West Agstone Operators Discuss Problems at Chicago

Producers of agricultural limestone met at the Palmer House, Chicago, April 23, to discuss problems of interest to those in the Middle West. The occasion was a joint meeting of the committee of the Midwest Agricultural Limestone Institute and a regional sub-committee of the National Crushed Stone Association. John Spencer represented the Illinois Agricultural Association.

The effects of the practices of the Agricultural Adjustment Administration with respect to the purchase of agricultural limestone under its soil-conservation program was discussed, as well as the difficulties of reconciling those practices with the management that has been in operation between the institute and the I.A.A. Also a topic of discussion was a proposal to raise the land requirement of Form 566 of the A.A.A. from 4 to 6 tons and the amount spread on the land from 1 ton to 2 tons per acre. There was some favor for a suggestion for fixing the C.C.C. (calcium-carbonate equivalent) at 80, but no action was taken.

In order to eliminate irresponsible idlers from the field it was proposed that limestone truckers should be classified according to their previous records as measured by monthly tonnages before being qualified for bidding under the A.A.A. plan and that they should, therefore, be restricted to that classification. Only the lowest *responsible* bidders needed to furnish the required tonnage should be accepted, it was said. It was also suggested that the prices to the farmer should be averaged and one man in each county authorized to "police" the situation.

The following agricultural-limestone producers and guests were present:

J. R. Bent (Dolese & Shepard Co., Chicago), secretary, Midwest Agricultural Limestone Institute.

W. F. Carter (National Stone Co., Joliet, Ill.).

H. O. Clark (Consumers Co., Chicago), treasurer, Midwest Agricultural Limestone Institute.

William E. Hewitt (East St. Louis Stone Co., East St. Louis, Ill.)

H. M. Hollingsworth (France Stone Co., Indianapolis, Ind.).

E. J. Krause (Columbia Quarry Co., St. Louis, Mo.), president, Midwest Agricultural Limestone Institute.

Stanley A. Phillips (Pit and Quarry, Chicago).

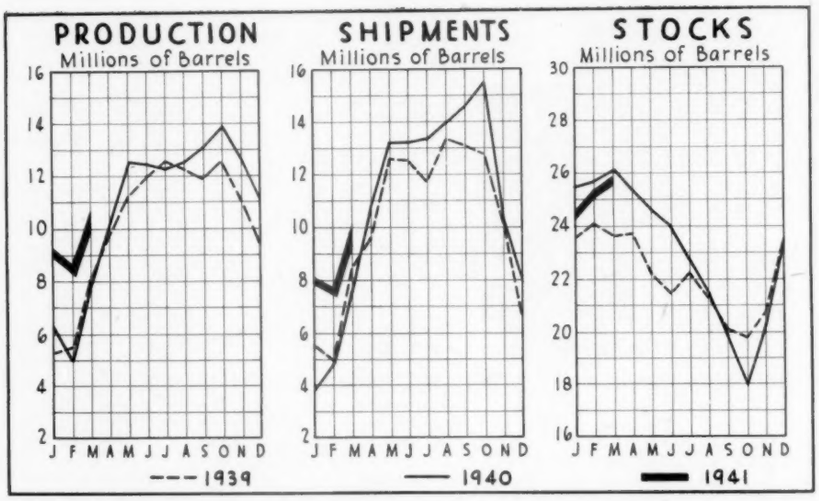
Ralph Quelle (Linwood Stone Products Co., Linwood, Ia.).

Dan Sanborn (Lehigh Stone Co., Kankakee, Ill.).

John Spencer (Illinois Agricultural Association, Chicago).

R. S. Torgersen (Rock Products, Chicago).

W. H. Traver (Elmhurst-Chicago Stone Co., Elmhurst, Ill.)



The Portland-cement industry in March, 1941, produced 10,600,000 barrels, shipped 10,056,000 barrels from the mills, and had in stock at the end of the month 25,853,000 barrels of cement, according to the Bureau of Mines. Production and shipments in March, 1941, showed increases of 33.9 and 30.3 per cent., respectively, as compared with March, 1940. Portland-cement stocks at mills were 1.0 per cent. lower than a year ago.

Cement, Lumber Firms Indicted at Denver

Four indictments charging violation of the Sherman anti-trust law were returned in federal court at Denver on April 14 against 240 defendants in the lumber and cement industry.

In the case of the cement companies, the indictment charges the defendants entered into a conspiracy not to sell cement at wholesale to retail dealers who refused to maintain set prices.

In the case of lumber it is charged that a Denver ordinance is used to force purchase of lumber bearing a certain grade mark and that this mark is controlled by a trust; that consumers are prevented from buying direct from manufacturers; that an unnecessary and expensive system of distribution has been set up; that only certain dealers are permitted to handle certain types of building materials; and that written pledges maintain fixed prices.

Inland Ups Wages of Men 10 Cents an Hour

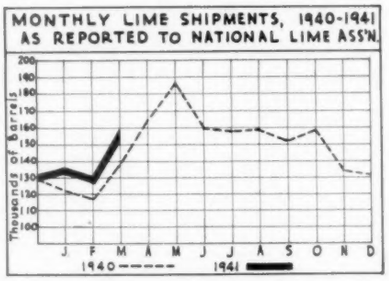
A general wage increase of 10 cents per hour has been granted the employees of the Inland Lime & Stone Company, Manistique, Michigan.

The increase is retroactive to April 1 and increases the plant and quarry payroll about $1,100 per week.

W. G. Kaiser Acquires Large Illinois Farm

A 215-acre farm near Capron, Illinois, was recently purchased from the Continental Casualty Company by William G. Kaiser, manager of the cement-products bureau of the Portland Cement Association, Chicago.

The farm, located about 55 miles northwest of Chicago, will be improved extensively by Mr. Kaiser and will be operated by the present tenant. Mr. Kaiser's home is in suburban Glen Ellyn.



According to data collected by the National Lime Association, 71 companies in March, 1941, shipped 159,890 tons (104,691 quicklime; 55,199 hydrate). Reporting companies represent 51.5 per cent. of the association's total capacity of record. Based on PIT AND QUARRY'S estimates for the remainder of the industry the total shipments for the month are estimated to have been approximately 310,000 tons. Shipments of lime by use and grade for March, 1941, were:

Use	Quicklime (tons)	Hydrate (tons)
Agricultural	987	8,619
Building	16,399	26,473
Chemical	87,305	20,107
Total	104,691	55,199

Concrete Durability Affected by Reaction Between Ingredients

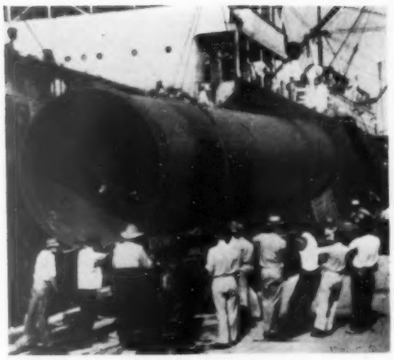
A form of concrete disintegration has been brought into prominence during the past few years and particularly during the past year, which is of importance, not only to cement producers, but also to aggregate producers, for there is evidence to substantiate the belief that the trouble is due to certain chemical reactions between the cement and the coarse aggregate.

The disintegration in question has been noted in very large structures in the West and in mass concrete in the East also, the National Crushed Stone Association points out. It takes the form of a network of surface cracking, the cracks in some cases having an opening of up to ⅛ inch and extending at least 12 inches into the concrete. It has been observed by actual measurement in selected cases of this sort, that the interior of the mass of concrete is growing in volume and, in all probability, the surface layer is either contracting or at least is not expanding. Concrete is weak in its resistance to tension (tensile resistance is about one-tenth of compressive strength) and, hence, if the above mentioned volume changes occur, the outer layer of concrete is stretched to such an extent that it cracks.

It has been found that in the pores of the concrete thus affected, there is a gel formation which seems to have been definitely identified as sodium silicate—commonly known as waterglass. Also, it seems to have been discovered by a process of elimination and by means open to the chemist and petrographer, that the trouble is confined largely to concretes in which Portland cement has been used containing a high percentage of the alkalies ordinarily reported by the chemist in the form of soda (sodium oxide, Na_2O and potassa (potassium oxide, K_2O), together with certain coarse aggregates of a highly siliceous nature. Among the rocks mentioned are andesitic and rhyolitic materials, certain siliceous limestones, cherts, shales, phyllite and several granites.

The exact nature of the chemical reaction does not seem to be certain, but apparently the alkalies in the cement combine with the silica of the stone to form sodium silicate and potassium silicate with an accompanying expansion in the interior, damp portion of the concrete and a probable shrinking of the outer layer.

Some very large structures are affected and the problem is being actively investigated by the combined efforts of a number of agencies. It is thought, for the present, that it will be advisable to limit the combined percentage of alkali in the cement (sodium and potassium oxides) to not more than 0.6 per cent. Some of the cements which are suspected of causing trouble had as much as 1.4 per cent. of combined alkali. This problem cannot be ignored by the aggregate producer, although only certain aggregates have caused trouble of the nature described and then only in combination with high alkali cements.



Unloading cement-making machinery from steamship for the new addition to the Puerto Rico Cement Corporation plant at Guaynabo. The kiln section being lifted is part of a 300-foot Allis-Chalmers cement kiln, equipped with air-quenching cooler. All the kiln sections are of welded construction as shown.

17 Technical Sessions for A.S.T.M. Meeting

Seventeen separate technical sessions are being scheduled for the forty-fourth annual meeting of the American Society for Testing Materials to be held at the Palmer House, Chicago, during the week beginning June 23 and extending through Friday, June 27. This number of sessions is necessary for the presentation of the 100 technical papers and reports and to provide time for discussion.

The sixth exhibit of testing apparatus and related equipment will also be in progress. The Society sponsors these exhibits, every two years, at its annual meetings. There is also being sponsored the fourth photographic exhibit on the general theme "Materials, Testing and Research."

Throughout the week of the meeting some 200 technical committees of the Society are expected to meet.

A 10-per cent. increase in wages, effective May 1, has been granted all employees of the Volunteer Portland Cement Company, according to a recent announcement.

About 190 workers participated in the benefits.

Residential Awards at Highest Point Since July, 1929

Residential contracts awarded during April, 1941 in the 37 states east of the Rocky Mountains were, according to F. W. Dodge Corporation, highest since July, 1929. The volume of April awards amounted to $166,462,000, an increase of 38 per cent. over April, 1940 chiefly because of the activity in the building of one-and-two-family houses.

As a result of this volume of residential building, 34,780 dwelling units were provided, while in the corresponding month last year only 27,418 were produced. Private-ownership construction, comprising 83 per cent. of the total, continues as the dominant factor in residential building.

All building and engineering contracts awarded in April totalled $406,675,000, 35 per cent. greater than the volume of $300,504,000 awarded in April last year. While April is 15 per cent. below March, the decline can be attributed primarily to a 25 per cent. decline in public-ownership construction due to an abnormal amount of defense work included in the March figures.

Stonex Reorganizes; Moves to Chicago

Stonex Industries, Inc., has been reorganized with Lester J. Lurie as president and M. H. White as general manager and sales manager. R. H. Sexton, founder of the company, is vice-president and will maintain the present office at 500 N. W. 79th Street, Miami. Since May 1, the main office of the company has been located at 33 North La Salle Street, Chicago.

Two Carney Warehouses Destroyed in Blaze

Fire recently destroyed two large warehouses at the plant of the Carney Rock Wool Company at Mankato, Minnesota. Fire fighters were able to save the main building and confine the fire to the warehouses at a loss of about $15,000.

Carrara Cement Plant Rushed to Completion

The new plant of the Carrara Portland Cement Company is being rushed to completion at Beatty, Nevada.

It is designed to produce 1,000 barrels daily.

The plant of the Automatic Gravel Products Company, Muscatine, Iowa, has been damaged by fire to an extent of about $20,000.

Oscar Lindahl Made Vice-President of Carnegie-Illinois

The Carnegie-Illinois Steel Corporation announces the election of Oscar N. Lindahl as vice-president in charge of finance, succeeding M. D. Howell, who will devote all of his time to duties as vice-president, financial secretary and treasurer of United States Steel Corporation of Delaware. Mr. Lindahl had been associated with the Universal Atlas Cement Company since 1911, most recently as comptroller and secretary. He served the cement company successively as general bookkeeper, chief accountant, auditor and assistant secretary, and comptroller and secretary.

Mr. Lindahl is chairman of the Executive Committee and a former president of the Controllers Institute of America, a member and former director of the National Association of Cost Accountants, a member of the Advisory Committee and a former president of the Illinois Manufacturers Cost Association and former chairman of the Accounting Committee of the Portland Cement Association.

Henry C. Schmielau as general auditor, and J. J. Heffernan, secretary, will take over Mr. Lindahl's former duties with the Universal Atlas company.

Greenland World's Only Source of Cryolite

The United States' interest in Greenland, in addition to its strategic military value, includes the fact the island is the only place in the world where cryolite is found in natural form in large quantities.

Cryolite is an aluminum ore used as a metallurgical flux in the melting of other aluminum ores, chiefly the oxide, to obtain aluminum. This unusual mineral, important in the manufacture of enamelware, glass, and pottery as well as aluminum, is Greenland's chief resource.

The ore is mined only at Ivigtut, in southwestern Greenland, on properties controlled by the kingdom of Denmark. The natural mineral from this mine has been available for import in this country only to the Pennsylvania Salt Manufacturing Company of Philadelphia, which processes it for commercial use.

Cryolite also can be produced artificially by combining fluorine, sodium, and aluminum, and in this form is used extensively in the extraction of aluminum.

Imports of natural cryolite into the United States in 1939 amounted to 10,000 tons, valued at $700,000, compared with 12,000 tons, valued at $780,000, imported in 1938.

Marquette Starts Work on Des Moines Plant

Work has started on a new $2,000,000 cement plant by the Marquette Cement Manufacturing Company at Des Moines. The new plant, which adjoins the old Hawkeye plant, will be housed in a steel and concrete structure. The general contract for its erection has been awarded Arthur H. Neuman & Brothers.

Burning equipment will consist of a single kiln 475 feet long and 11½ feet in diameter. Among other equipment which will be installed is a battery of 12 Minogue agitators.

Work has started on a $300,000 improvement program at the Independence, Kansas plant of the Universal Atlas Cement Company.

C. M. Carman is superintendent.

Quarry and plant operated near Bangor, Alabama, by the state's highway department. A Caterpillar Diesel engine drives a Gardner-Denver compressor to supply air for the drills. Dempster-Dumpster detachable buckets and hoists mounted on International trucks haul the stone to the crusher.

Determine Fineness of Cement by Quick Laboratory Method

A quick method of determining the fineness of Portland cement was revealed recently by the engineering-materials laboratory of the University of California.

Fineness in cement is particularly important in the building of large structures, such as great power dams, because it influences the speed of curing in concrete. The finer the cement, the faster the curing, which in turn means lower finishing costs and earlier use of the structures.

The instrument used is a modified type of hydrometer. It is a glass container with graduated markings. It is filled with alcohol and a sample of the cement is sprinkled onto the liquid.

The particles of cement sink slowly through the liquid toward the bottom of the container. The largest ones sink the fastest. As each group of particles of one average size sinks a given distance in a given length of time, the hydrometer readings automatically show the proportion of particles of that particular magnitude. The readings also register the average surface area of these particles.

Still smaller fragments then sink and the same measuring is done until all in the sample are classified. The tester then knows the proportion of each group of particles according to size and also the average surface area of the particles in each division.

In ordinary Portland cement the coarsest particles will pass through a 200-mesh screen, which means the largest of them are smaller than one two-hundredth of an inch. But most of them are much smaller than that. They range in size from .0029 inch to .00004 inch.

National Gypsum Now Ships via Barge Canal

The National Gypsum Company, which formerly obtained gypsum rock for its New York plant from Nova Scotia by ocean freighters, is now shipping rock from its Clarence and Akron, New York, mines *via* the Barge Canal to release Atlantic vessels for other shipments.

Sand-and-Gravel Firm to Erect Warehouse

The Bremerton Sand & Gravel Company, Bremerton, Washington, will shortly erect a warehouse to cost about $3,000.

CURRENT BUSINESS INDICATORS

Wednesday, May 28, marked the first anniversary of our "all-out" defense program. It was on that date a year ago that the Advisory Commission to the Council of National Defense was created and the first faltering steps were taken to shift the country to a war-time economy. So much has happened during the intervening months that a brief stock-taking is necessary in order to view the developments that have taken place in the proper perspective.

Overshadowing all other features of the past year has been the enormous increase that has occurred in industrial production. Measured by the Federal Reserve Board's index of production in manufacturing and mining, a gain of roughly one-fourth is shown in the general level of industrial activity. Virtually all branches of industry have contributed to this increase, but the impact of the defense program has been unequally distributed. Against comparatively modest gains for the consumer-goods industries, spectacular advances have been made by the typically defense industries. Aircraft production, for example, has been more than trebled during the past twelve months. At the same time, outputs in the shipbuilding and railroad equipment industries have been doubled. Output has also been stepped up in an impressive fashion in the iron and steel, machinery, non-ferrous metals, and stone, clay, and glass industries.

Despite the dramatic progress that has been made, production in a large number of industries is still lagging far behind defense needs. According to John D. Biggers, director of production of the Office of Production Management, the present rate of output of machine guns must be increased fivefold, tanks quadrupled, small-arms ammunition trebled, and military airplanes doubled before the end of the current year.

What are the prospects of meeting these requirements? Quite bluntly the chances are none too bright. We have learned a great deal about the potentialities of our industrial facilities during the past year, and much of the easy optimism that characterized our thinking of a few months ago has been rudely shaken. We realize now the magnitude of the task that has been blocked out for us and, while American industry may be able to rise to the emergency, the effort will strain our resources to the limit.

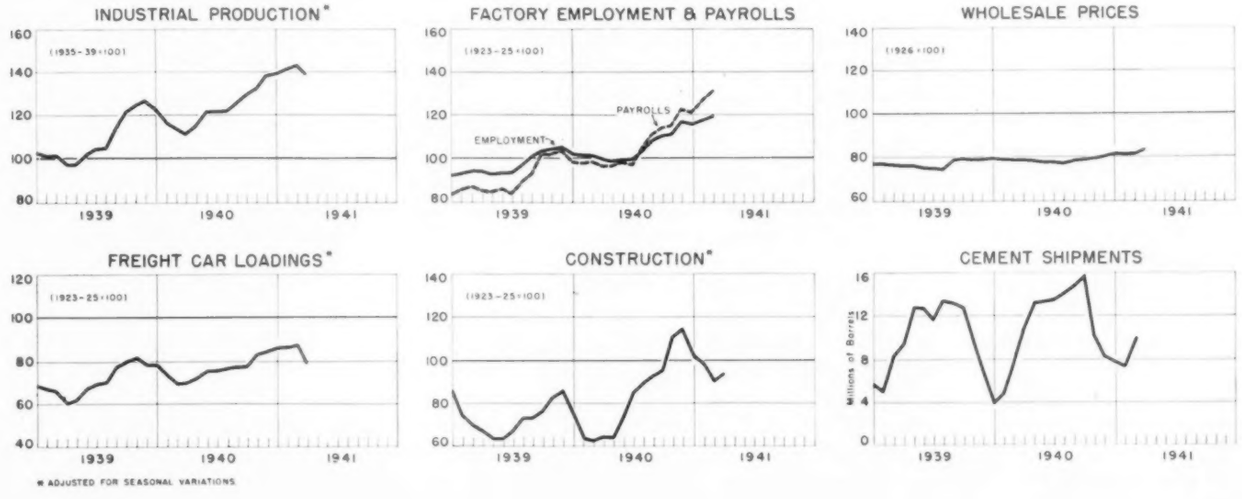
Most serious of all limiting factors is the acute shortage of certain basic raw materials that has developed in recent weeks. Already there are seven items that can not be secured in this country without the permission of the Priorities Board in Washington. The materials that are now subject to mandatory priorities are aluminum, nickel, nickel-steel, magnesium, ferro-tungsten, Neoprene, and machine tools. Most competent observers agree, moreover, that there are a number of other items that are certain to be added to the list within the course of the next few weeks.

In Washington the inclination is to attribute the failure of defense output to meet defense needs to the reluctance of industry to expand productive facilities, or to industry's tardy recognition of the need for subcontracting.

Although the record for the past year is disappointing in some respects, many of the obstacles that tended to impede production during the early months of the defense program have now been cleared away and the program is generally expected to proceed in a considerably more orderly fashion in the months to come. Developments of recent weeks have indicated emphatically the tremendous force that is now actuating industrial production. As was anticipated, the labor disturbances in the soft coal and automobile industries were responsible for an abrupt decline in industrial activity in April. From 143 per cent. of the 1935-39 average in March, the Federal Reserve Board's composite index of production slumped to 139 in April, approximately the same level as prevailed at the beginning of the year. This loss, however, was more than wiped out within two weeks after the settlement of the disputes and, barring further labor difficulties of major proportions, industrial activity is virtually certain to establish a new all-time high in May.

Notwithstanding the labor difficulties, the volume of engineering construction awards during April was at the highest level for any corresponding month on record. According to *Engineering News Record* total awards for the month aggregated $381,563,000, a gain of 80 per cent. over the corresponding month of last year and a 20 per cent. increase over the former April high that was established in 1929.

The rising trend of wholesale commodity prices has continued in recent weeks without interruption. For April the Bureau of Labor Statistics' index for all commodities rise to 83.2 per cent. of the 1926 average, compared with 81.5 in the preceding month and 78.6 in the corresponding month of last year. Further advances in wholesale prices were recorded during the first half of May and Washington is becoming persuaded that specific price control legislation will be necessary to check the advance and avert inflation.



EDITORIAL

Defense for War—V

IN every period of international conflict the profits of those industries engaged in the production of the implements of war rise to unprecedented heights. In the first three years of World War I, 1914 to 1917, the number of millionaires in this country nearly trebled, rising from 7,509 to 19,103, according to statistics published by the Bureau of Internal Revenue. Corporation profits rose at an even greater rate in some cases, the net income of one steel company, for example, having jumped from $50,614,000 in 1915 to $246,312,000 in 1916 after the deduction of all fixed charges, taxes and preferred dividends. The growth in the profits of other companies furnishing war materials, while not of the same magnitude, displayed similar ratios.

The cost of living rose continually and jerkily and millions of persons struggled desperately in their efforts to make their incomes cover the day-to-day increases in the cost of the bare necessities of life. As a means of attaining that objective millions of workers who had never belonged to any labor union hurried to join the existing organizations, and in the six-year period from 1914 to 1920 labor-union membership doubled; one organization, the American Federation of Labor, grew from 2,020,671 members to 4,078,740 in that time. Yet, despite this tremendous effort to keep pace with constantly mounting living costs, real wages made little headway. From 1914 to 1918, according to Professor Paul H. Douglas of the University of Chicago, the annual wages of the average worker in the manufacturing industries rose from $580 to $980, but the cost of living increased so much more rapidly that real wages rose but 8 per cent. in the period.

World War II is already repeating much of such history. While there have been wage increases in some industries, these changes have been based on profit increases, either realized or expected, and there is considerable doubt as to whether the increases have been commensurate with either profit increases or rises in the cost of living. In August of last year the *Monthly Survey of Business,* published by the A. F. of L., said that corporation profits were already "approaching all-time peaks. Prospective profits of 400 leading industrial corporations for 1940 amounted to $2,280,000,000, which almost equals the average of 1916-1917, high points of the last war, and approaches the prosperity peak of 1927-1929 (average $2,565,000,000 yearly) and the recovery peak of 1937 ($2,412,000,000). Full-year 1940 profits will exceed last year's by 23 per cent." On the subject of wage increases it said: "Corporations have not increased wages as much as their earnings permitted. A larger flow of income to workers is vital. Newly created wealth must lift the living standards of low-income groups. We need the flow of their buying power into non-defense consumer-goods industries to keep these industries growing in a normal way, prevent top-heavy defense development, build up our national well-being." In March of this year the same source revealed that one automobile company's profits were $717 per employee, those of a steel company $402, those of a chemical company $1,363, those of a telephone company $689, those of an electrical machinery manufacturer $747.

From another labor source—James B. Carey, secretary of the C. I. O., in a broadcast over the National Broadcasting Company's Blue Network—came the information that, although the federal government has shown $2,200 to be the minimum annual income needed to support a family of five in "modest decency," less than 8 per cent. of the workers of the United States had an income of that amount. "Less than 23 per cent. got $1,400 a year," he continued. "Less than 29 per cent. had $1,200 to spend on themselves and their families each year. One-third of all the workers in the nation earned less than $400 a year—and $400 is less than one-fifth of $2,200." The executive board of the same organization said recently in the *Economic Outlook* that the C. I. O. would continue to strive to "improve the wage structure for our members and obtain improved working conditions. This involves getting for the workers an increasing share of mounting profits. Such increases can readily be obtained without necessitating increases in the cost of living or in the price structure."

These are some of the factual data and the philosophy that underlie current strikes. The workers involved recognize the futility of trying to better their lot when business is "bad" and therefore exert their greatest pressure when business is "good." Except for those strikes which have been called in an attempt to obtain the rights guaranteed by the Fair Labor Standards Act of 1938 and the National Labor Relations Act, this is present-day labor-organization strategy. The success already won in recent months by the C. I. O., for example, gives some standard for predicting what yet may be expected from the growing strength of organized labor. With the A. F. of L., the C. I. O., the Railroad Brotherhoods, and other organizations including more than 9,000,000 workers in their memberships, the possibility of that number being doubled—as it was in World War I—throws some light on the probable effects of the labor vote in the next presidential election.

BUSINESS is not unmindful of such a possibility, nor of its dangers, as is amply attested by the stubbornness with which attempts at organization by unattached workers are opposed. These efforts to resist organization sometimes take the form of attempts to discredit labor in the eyes of the public, as witness the recent clamor about the alleged effects of strikes on production for defense. The facts refuting such claims come too late to prevent the distortion of public opinion that results from blind acceptance of statements that are not supported by dependable data.

Because unity of thought is one of the most powerful weapons any nation can possess, it is important in the successful execution of our defense plans that public opinion on industrial relations should not be divided by dishonest appeals to prejudice, whether such appeals come from labor or from capital. Present conflicts between employers and workers arise, in the words of the Temporary National Economic Committee's monograph on *Economic Power and Political Pressures,* "out of the attempt to apply democratic principles to industrial relations." If there were a wider recognition of this fact there would be fewer strikes and less division of public opinion.

Price Competition in Los Angeles Area Has Producers Keeping Watchful Eye on Costs

General view of El Monte plant with primary conveyor in foreground and stockpiling conveyor at left.

By W. E. TRAUFFER

This view shows the pit conveyor, scalping screen, crusher, plant-feed conveyors and return conveyor.

YEAR in and year out the price for which sand and gravel are produced and sold in the Los Angeles area is probably lower than anywhere else in the country. As a result production costs are of paramount importance and savings of even a fraction of a cent per ton are not ignored. In order to exist producers in this area have been forced to make their plants models of efficient and economical operation which have their equals in few other sections. It is not strange that these plants have contributed many advances in methods and equipment to the industry.

One of the most interesting of these plants is that of Graham Brothers, Inc. east of Los Angeles at El Monte, in the San Gabriel Valley of California. This is a compact and efficient plant with a capacity of 350 to 400 tons per hour. It replaced the company's original 200-ton-per-hour plant which was built in 1929 and had become obsolete. Dismantling of the old plant was begun on December 24, 1938 and the new plant went into operation March 1, 1939. During the interim shipments were made from stock-pile. This plant was designed by the company's engineering staff under the direction of Paul C. Graham, president and general manager of the company.

The new plant is built entirely of steel and concrete and is designed to be earthquake-, fire- and flood-proof. This type of construction was considered advisable for the added reason that the 120-acre deposit contains enough material to keep the plant going more than 10 years, which is the average life of a wooden plant structure in this area. The plant was designed to eliminate expensive stock-piling and rehandling of finished products. It has no provisions for the direct rehandling of excess large sizes for reduction and reprocessing. No gravel is crushed until ordered and the flexibility of the plant gives many options in supplying different demands simultaneously. For these reasons little reprocessing is necessary.

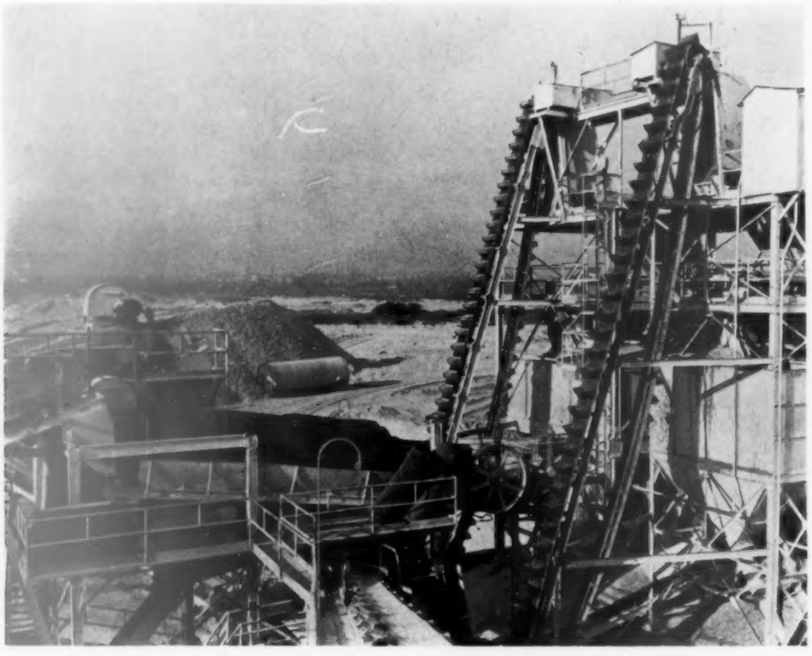
The deposit has no overburden. It averages about 35 per cent. sand, and about 30 per cent. of the gravel is under 1½ inches in size. There are many bowlders which are mostly under 18 inches in diameter.

Tractors and wheeled-scrapers are used to excavate the material in the pit and haul it to the plant. The company pioneered in the use of this type of equipment in 1935 at several temporary plants which it operated to supply aggregates for the Colorado River Aqueduct. This method was then used successfully at the old El Monte plant. At first rented vehicles were used but in November 1936 the present equipment was purchased. Later operations progressed beyond the economical operating distance for this equipment and shovels and trucks were used. The memorable flood of March 1937 washed over a million tons of material back into the pit in two days and the scrapers were again put into service.

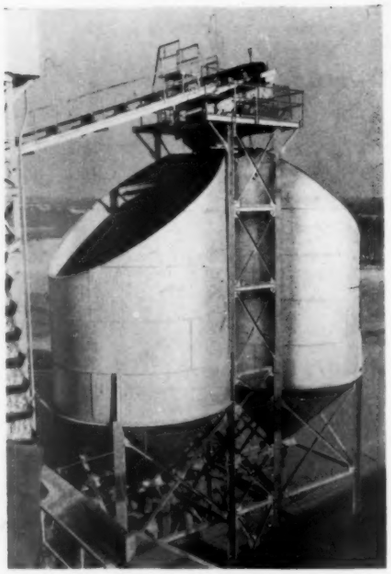
The pit equipment consists of two Le Tourneau 12-cubic yard Carryall scrapers, each hauled by an International C-60 chassis equipped with a Le Tourneau power unit. Loading is accomplished on a down grade by means of an R-D 8 Caterpillar tractor equipped with a bulldozer which contacts a pusher bar mounted on the rear of the Carryall. After loading the truck transports the loaded Carryall to the trap at speeds up to 25 miles per hour, and returns to the loading zone at higher speeds. The pusher Caterpillar

One of the truck hauling units loading one of the scrapers with a tractor acting as a booster. Note the pusher bar on the back of the scraper.

Looking down on the two sand drag washers. At upper right are some of the oiling bottles which are connected by flexible lines to inaccessible bearings.

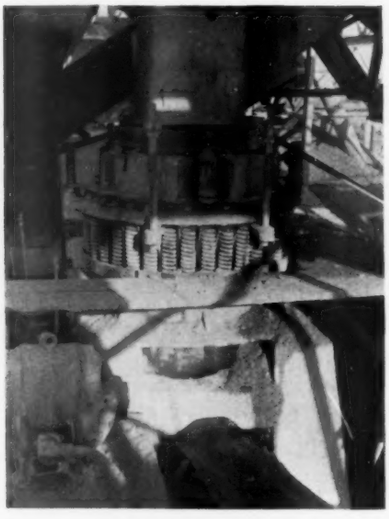


The revolving gravel sizing screen which removes sand and oversize. The other three sizes made are elevated to a final sizing screen over a bin at right.



The two 450-ton bins and the screen used for making special sizes of crushed gravel.

The scalping screen, primary crusher and the gravel and crushed-gravel conveyors.



One of the two cone reduction crushers used in the El Monte plant.

in the meantime has assisted in the loading of the second carrying unit. This method makes it possible to load 18 tons in each scraper. The scrapers discharge their loads into the 80-ton steel plant hopper which has a 16-inch rail grizzly. Each carrying unit makes a 1,000-foot round trip in from 4½ to 5 minutes.

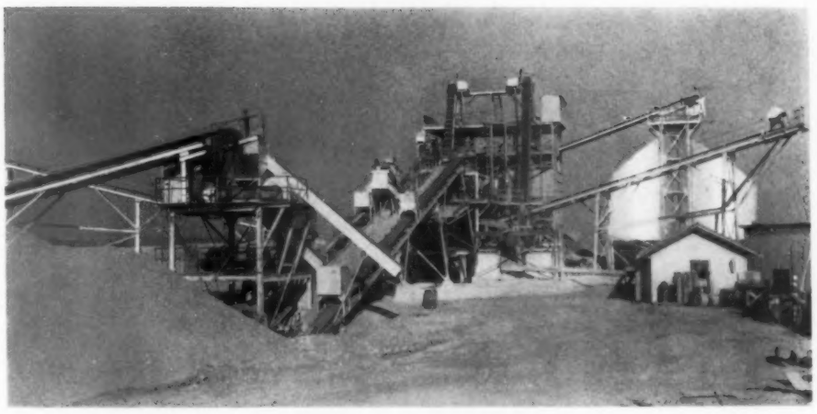
The scrapers are also used to transfer oversize gravel from its stock-pile to the plant hopper. They also build up raw-material stock-piles for use during periods of high water. A 1- or 2-day supply of raw material is always kept near the plant hopper so it can, if necessary, be moved by the bulldozer, which is also used to move drained sand over the truck-loading tunnel and for other similar work. This miscellaneous work keeps the tractors and scrapers busy all the time and eliminates the necessity for special rehandling equipment which would stand idle most of the time.

The vibrating feeder which discharges material from the pit hopper on conveyor to plant.

A Jeffrey-Traylor vibrating feeder discharges the minus 16-inch gravel from the hopper on a 48-inch by 140-foot belt-conveyor to a 4- by 10-foot Simplicity 2-deck vibrating scalping screen which is usually equipped with 3½-inch-opening square wire cloth. For special orders 1⅝-, 2½-, 3½-, and sometimes 6-inch openings are used. This screen controls the split of material to the natural- and crushed-gravel departments of the plant.

The gravel passing through this screen, usually minus 3½-inch, is carried on a 30-inch by 120-foot belt-conveyor to a Stephens-Adamson 4- by 24-foot revolving screen with 19½- and 18½-foot outer jackets. On the main barrel is 20 feet of 1⅝-inch square-perforated plate followed by 4 feet of 1⅝-inch square perforations. On the first jacket ⅜-inch wire cloth with No. 9 wire is used. The outer jacket controls the production of concrete or plaster sand. When concrete sand is desired 3½-mesh wire cloth with No. 15 wire is used.

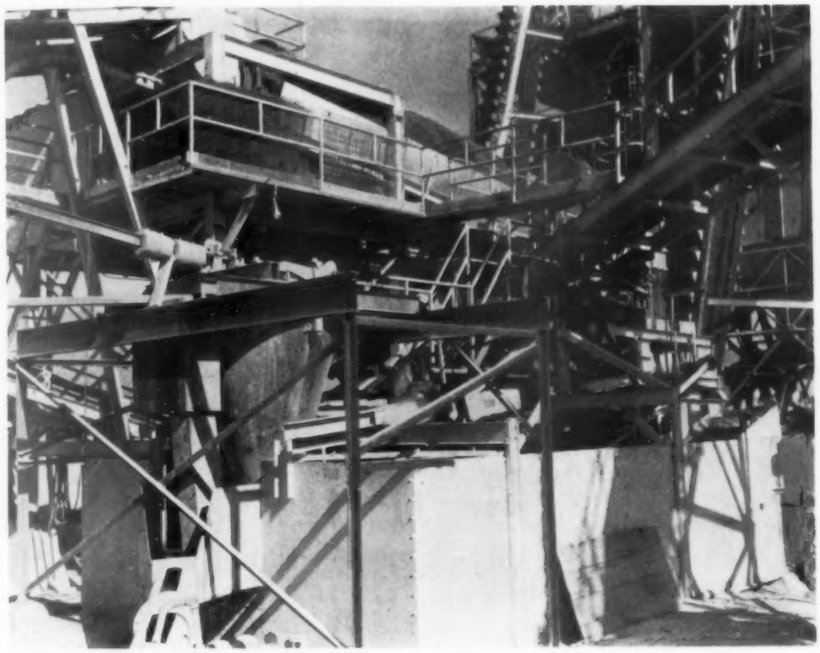
Oversize material from the main barrel of this screen can go either to the 3-foot Symons finishing crusher or to a 24-inch by 100-foot conveyor to the oversize-gravel stock-pile. This rock can be re-run for the production of crushed gravel.



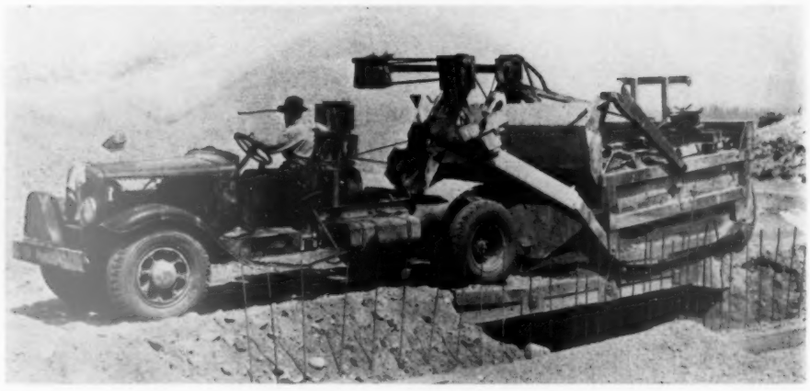
This view of the plant shows clearly the dual arrangement of equipment for the production of gravel and crushed gravel.

Sand passing through the outer jacket goes to a drag-washer of the company's own design. This consists of two 16-foot drags with 8-foot paddles in one square compartment. The overflow is wasted and the sand is discharged on a 24-inch by 20-foot cross belt-conveyor to a 30-inch by 150-foot sand stock-piling conveyor. After the sand has been dewatered sufficiently a tractor equipped with a bulldozer moves it over a steel tunnel, 16 feet in diameter and 147 feet long, in which trucks are loaded. About 1,000 tons of sand can be stored over this tunnel.

The three sizes of gravel made by the revolving screen, including pea gravel, are discharged together to a 55-foot bucket-elevator which feeds them to a 3½- by 12-foot Symons 2-deck screen. Ordinarily a 1⅛-inch wire cloth is used on the top deck and ⅝-inch on the bottom deck. The No. 2 gravel off the top deck goes direct to a bin. The gravel retained on the bottom deck is blended with ⅝-inch to ⅜-inch made on a lower deck to produce No. 3 gravel. The gravel passing through the bottom deck goes to a 3½- by 8-foot Symons 2-deck screen with ⅜-inch wire cloth on the top deck and 3½-mesh wire cloth on the bottom. The material passing over the ⅜-inch deck is a special product for a concrete-pipe manufacture. The product passing over the 3½-mesh cloth goes to pea-gravel bins. When the pea-gravel bins are full, this material can be discharged from the revolving screen on a 24-inch by 60-foot stock-piling conveyor. The material



Another view showing the sand drags, the revolving gravel-sizing screen, a stockpiling conveyor and the two bucket elevators.



One of the truck hauling units and a 12-cubic yard scraper ready to discharge its load into the pit hopper.

passing through the 3½-mesh cloth is wasted.

The oversize, usually plus 3½-inch gravel, from the Simplicity vibrating scalping screen goes into the 16B Telsmith gyratory primary crusher. The 4- to 5-inch product of this crusher is carried on a 24-inch by 120-foot belt-conveyor to a 4- by 12-foot 2-deck Symons screen, which is equipped with 1⅜- and ¾-inch wire cloth on its top and bottom decks respectively. The plus 1⅜-inch gravel retained on the top deck can be discharged on the oversize conveyor to the stock-pile mentioned above or it can be discharged into a Nordberg Symons 4-foot cone crusher. The 1⅜-inch to ¾-inch product can be discharged to a bucket-elevator or to the 3-foot Symons crusher. Material from the oversize stock-pile can be re-run through the plant if desired. The product of the finishing crusher is taken by a 24-inch by 80-foot return belt-conveyor which can discharge it on either of the two main belt-conveyors leading from the scalping screen.

The material retained on the bottom deck of the 4- by 12-foot crushed-gravel screen can be discharged into the finishing crusher or on the oversize stock-piling conveyor, or it can be discharged to a bucket-elevator and then to the fine-sizing screens. The material falling through the bottom deck of the screen always goes to this elevator.

Crushed gravel is discharged from the elevator on a 4- by 12-foot Symons 2-deck screen which is equipped with ¾- and ⅜-inch wire cloth. Material dropping through the bottom deck of this screen goes to a 4- by 10-foot Robins Gyrex 2-deck screen with 4- and 5-mesh wire cloth. The No. 2 and No. 3 crushed gravel from the Symons screen and all three sizes of crushed gravel from the Gyrex screen are usually discharged into separate bin compartments. The No. 2 and 3 crushed gravel can also go on the 30-inch by 60-foot belt-conveyor to the two 450-ton bins previously mentioned. A 3½- by 12-foot 2-deck Symons screen over these bins can be used to make special sizes if desired. These bins are circular, with conical bottoms, and tops which slope away from the conveyor and screen discharge point along the natural aggregate slope line.

The main bin-storage system is unique in that it is a 2-level structure. There is a 4-compartment square steel bin under the final plain-gravel screens and a 4-compartment bin under the final crushed-gravel screens. These bins have total capacities of 175 and 290 tons respectively. Under them is a 2-lane concrete truck-loading tunnel over which two sizes each of gravel and crushed-gravel are stored. The live-storage capacities of these materials are 200 and 300 tons respectively. The material in the bins is discharged through pipes to individual truck-loading gates in the tunnel. These gates are operated by levers located at each end of the tunnel. In this way it is possible to store 12 different materials over the main tunnel—in addition to those in the two 450-ton bins next the tunnel—and the sand. The bins are supported on the top of the concrete tunnel which is at ground-level. The bottom of the tunnel is 20 feet under ground-level.

This type of storage is very compact but there is another reason for its selection. When the rainy season causes floods in the San Gabriel River the pit, and sometimes even the loading tunnel, is under water. In this case material is fed to the plant from raw-material stock-piles built up for this purpose around the plant. The chutes under the steel bins can then be altered so that trucks can be loaded through them.

All the gates in the tunnel are equipped with drains and an automatic electric pump in a sump keeps it free of water under normal conditions.

Maximum efficiency and capacity are obtained in this plant largely because of the effective control of all its operations. A rheostat at a central switchboard controls the vibrating feeder under the plant hopper. All the equipment in the plant can be stopped from this board. On the scalping-screen deck is another panel which controls all the equipment from that point back into the pit.

A speaker system is used for communication between the dispatcher in the office, the plant foreman and the mill man on the top of the plant. This makes it possible for the dispatcher to

The Roscoe pit with primary crusher and feeder conveyor at left, raw stockpile and conveyor in center, and main conveyor and plant at right.

The screw conveyor which feeds pea gravel from its stockpile to a belt conveyor.

be kept informed at all times of the material available and enables the mill man to prepare the required material to fill orders on hand. This is important in a plant without rehandling equipment. A loud speaker outside the plant makes it possible for the dispatcher to give the drivers their orders direct and helps speed up truck loading. Empty trucks arriving at the plant are loaded and on their way again in an average of 10 minutes. All truck shipments are weighed on a Fairbanks truck scale.

On the field conveyor in the pit is a Westinghouse ammeter which records on a tape when delays occur, how long the pit is shut down, when the conveyor is running light. etc. All important delays are checked and the explanations for them are recorded on the tape. In this way many of the causes for delays have been traced and eliminated. The psychological effect of such a record is important. This system was first used in the old plant and reduced delays from 21 per cent. to only 3 to 4 per cent. of the total operating time. Similarly good results are being obtained in this plant.

All the tractors are equipped with Servis recorders which show all the delays. Such recorders are also used on all the 100 delivery trucks operated by the company, including 30 concrete truck-mixers. The operators of these machines must account for any unusual delays shown on these records.

The efficiency of the methods used is evident from the fact that six men and the foreman form the entire crew. There are 2 tractor operators, 2 mill men, a truck-loader, and the dispatcher. Repairs are made by a plant-maintenance crew.

Except for the conveyor idlers and

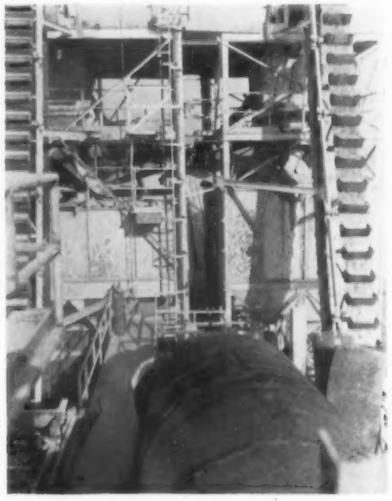
The pump which transfers all waste water to a pond at the El Monte plant.

screens, which have anti-friction bearings, all the equipment in this plant has babbit bearings. There is not a grease cup in the plant, however, as all these plain bearings are oiled by a system installed by the Standard Oil Company of California. For each bearing there is a small glass bottle filled with oil which is inverted over the bearing or on a line leading to the bearing, depending on the accessibility of the bearing. The bottles for the inaccessible bearings are grouped at a convenient location with flexible copper and rubber lines leading to the bearings. A pin in the mouth of the bottle or at the end of the line, as the case may be, rides on the shaft inside the bearing and the vibration causes oil to flow past the pin into the bearing. When a bottle is empty it is replaced with another and refilled.

This lubrication system has proved to be very satisfactory. No bearings so oiled have ever burned out and they last much longer than ever before. The saving in lubricant is considerable. Only 100 gallons of 26-cent oil was used during the busy period from May through November in this plant.

With a few exceptions all the equipment is driven through Falk speed-reducers.

All the water used in this plant comes from a well 200 feet deep. A Byron-Jackson turbine pump supplies 600 g.p.m. at 58-pound pressure to the plain-gravel side of the plant. The waste water goes through a 100-foot pipe to a sump from which it is transferred to a waste pond by a Kimball-Krogh pump. The present ground-water level at this location varies be-



This view of the El Monte plant shows the revolving screen, elevators and final-sizing screens.

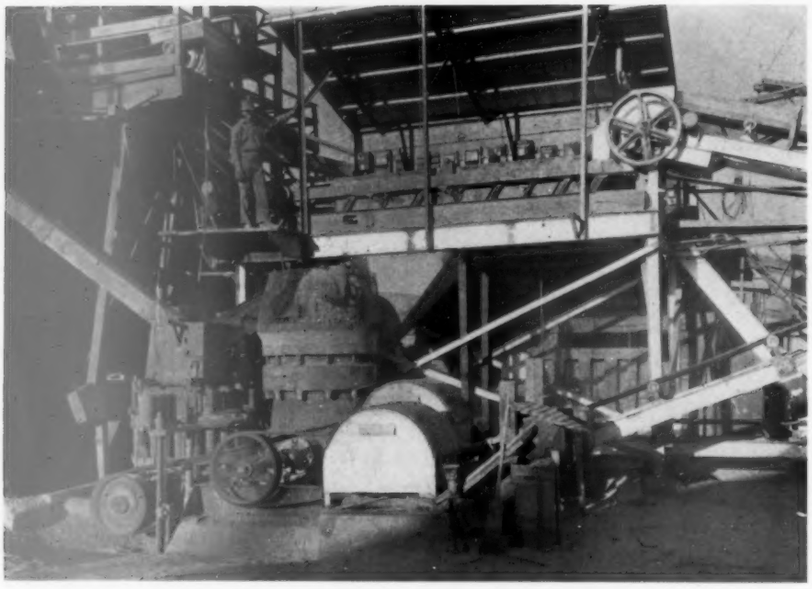
tween 65 and 90 feet below the surface.

The company's plant at Roscoe in the San Fernando Valley has also been improved and enlarged during the past few years and for other reasons is worthy of a description. The former plant capacity of 65 tons per hour has been increased to 275 tons and this transition was achieved with only a few days of lost time. The only equipment added was a larger primary crusher and an additional secondary crusher. Improvements in the pit increased its capacity to 350 tons per hour. It was found that 40 per cent. of the plant lost time was due to delays in the pit so a raw-material stock-piling system was installed. Due to this and other improvements plant lost time now averages only about 4 per cent.

The pit at the Roscoe plant has about 65 feet of gravel and fine sand. Below this level the sand and gravel become progressively coarser down to the present bottom level of the pit 150 feet below the surface. Various methods have been used to excavate this material and feed it to the plant. At present a tractor and bulldozer are used to push the material down the pit slope to the hopper of a conveyor system to the plant.

When fine sand and gravel are needed to blend with the coarser mate-

A closer view of the Roscoe pit showing the crusher and feed conveyor. The sand truck-loading tunnel is in background.



The vibrating sizing screen at the Roscoe plant with the cone and gyratory crushers which reduce its oversize and intermediate products. Return conveyor is at right.

rial these are obtained through a steel-lined tunnel extending 40 feet into the bank. A truck is loaded through an air-operated gate in this tunnel and discharges the material into the pit hopper. A tractor with a bulldozer is used at night to push material over this tunnel.

The material falls from the hopper on a 36-inch by 65-foot belt-conveyor, from which it is discharged over a rail grizzly into the 24- by 36-inch Traylor Bulldog jaw crusher. The minus 4-inch product of the crusher and the grizzly "throughs" are carried on a 30-inch by 140-foot belt-conveyor to the raw stock-pile in the pit. This stock-pile is over a 32-foot steel tunnel and has a live-storage capacity of about 320 tons reclaimable through a single gate. A Jeffrey-Traylor No. 5 electric vibrating feeder discharges this material on the 26-inch by 324-foot main belt-conveyor to the plant. This feeder is controlled from the plant, making it possible to adjust the rate of feed to the plant's capacity under varying conditions. The uniformity of feed possible with this feeder has also contributed to the increased capacity of the plant. As the pit is enlarged the stock-piling conveyor will be lengthened, resulting in greater stock-pile capacity. A Westinghouse recording meter keeps a record of all the delays.

The deep-well pump which supplies all of the wash water for the El Monte plant.

This main conveyor is followed by a 26-inch by 60-foot belt-conveyor which feeds the sand and gravel to a 42-inch by 15-foot revolving screen. This is usually equipped with 1½-inch perforated plate on its main barrel and .104- by ¾-inch opening wire cloth on its outer jacket. The unwashed plaster sand passing through this jacket is carried on a 120-foot inclined belt-conveyor to a 60-foot stock-piling conveyor with a tripper over a 178-foot steel reclaiming tunnel. When unwashed concrete sand is desired 3/16- by ¾-inch wire cloth is used on the sand jacket. The product is then discharged direct from the end of another inclined belt-conveyor on the stock-pile, which has a live-storage capacity of 2,500 tons. Ten gates are provided for loading out sand.

The plus 1½-inch oversize material from the trommel is carried on a short belt-conveyor to a 4- by 8-foot 2-deck vibrating screen, from which the plus 3-inch gravel goes into a No. 6 Allis-Chalmers McCully gyratory crusher and the 1½- to 3-inch gravel goes into a Symons 3-foot cone crusher. The products of both crushers are discharged on a belt-conveyor which feeds back to the conveyor ahead of the vibrating screen.

The material falling through the bottom deck of this screen, usually minus 1-inch, is fed by a bucket-elevator to a 41-inch by 15-foot trommel with two extra jackets. Products of this screen are discharged into truck-loading bins.

The minus 1½-inch gravel from the first trommel is fed, together with some of the unwashed sand passing through its outer jacket, to a 20-inch by 60-foot belt-conveyor. A bucket-elevator then feeds this material to a third trommel equipped with washing sprays. The three sizes of gravel produced are discharged into bins. Sand goes to a drag-dewaterer from which it is discharged into bins.

The firm of Graham Brothers, Inc. got its start in 1909, when Paul C. Graham and his brother, Robert, started hauling bank sand and gravel by mules and wagons in Long Beach. The first sand-and-gravel plant was built in Long Beach in 1914 and in 1922 the quarry and crushed-stone plant on Catalina Island were started. In 1928 and 1929 the company erected sand-and-gravel plants in the San Gabriel and San Fernando Valleys and in Orange County. In 1932 it went into the production of ready-mixed concrete.

Now, in addition to the plants at El Monte and Roscoe, the company also operates sand-and-gravel plants near Orange and San Juan Capistrano. The combined capacity of these plants is about 300,000 tons per month. Aggregate-distributing plants are located at four different points in the Los Angeles area. All but one of these plants and yards are equipped to load concrete truck-mixers. The company also operates four portable batching plants and a semi-portable batching plant with an aggregate-storage capacity of 50 cubic yards.

Phosphate-Rock Sales Exceed 4,000,000 Tons

For the second time in the history of the industry shipments of domestic phosphate rock have reached the 4,000,000-ton mark. Total shipments in 1940, as reported by American producers to the Bureau of Mines, were 4.002,700 long tons valued at $12,334,662, an increase over 1939 of nearly a quarter of a million tons or 7 per cent. but short of the 1920 record peak by about 100,000 tons. Mine output likewise passed the 4,000,000-ton mark, exceeding 1939 but considerably below the 4,261,416 ton peak of 1937. Domestic demand for phosphate rock in 1940 jumped 16 per cent. over that of 1939, an increase of 442,597 tons, far more than counterbalancing the 21 per cent. decrease, or nearly 200,000 tons, in exports which declined to only 751,495 tons.

Trade journal prices for various grades of domestic phosphate rock were unchanged in 1940. Florida land pebble, 68 per cent. B.P.L., continued at $1.90; 70-per cent. grade at $2.15; 72-per cent. grade, $2.40; and the 75-per cent. grade at $2.90.

The Lubrication of Equipment

Part VI. Pumps

By JAMES I. CLOWER
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COMPARED to most machines pumps are the acme of simplicity. They are ruggedly constructed, have few moving parts and, as a whole, are well designed. They play an unobtrusive but generally a very important part in most production schemes. They are often on duty day and night, and are frequently relegated to out-of-the-way corners of the plant. They are quite often neglected but generally operate satisfactorily without faltering or failing. To this end correct lubrication is very important. Correct lubrication not only involves the use of the proper lubricants but also the correct application in the quantities demanded by the unit.

Types.—Pumps may be broadly classified as centrifugal, rotary, and reciprocating. Each of these groups is made in a wide variety of types and models in order to meet specific requirements. Regardless of the group, type, or model, they are all made to perform one fundamental duty—to move or lift "liquid materials" against a resisting pressure. The term *liquid materials* must necessarily be used in a very broad sense in any discussion of pumps because it must include true liquids, such as water and oil, granular substances, such as sand, silt, grains, etc., and various true liquids in which are suspended solids, such as sand, silt, earth, gravel, and rock.

The Centrifugal Pump.—The centrifugal pump, as the name implies, employs centrifugal force to lift the liquid material from a lower to a higher level. This type of pump in its simplest form comprises an impeller rotating in a volute casing, as shown in Figures 1 and 2. Liquid material led into the center of the impeller is picked up by the vanes and accelerated to a high velocity by the rotation of the impeller, which discharges it by centrifugal force into the volute casing and out the discharge line.

Because of its simplicity, low cost, ability to operate under a wide range of conditions, and handle practically any sort of pumpable material, the centrifugal pump is the most generally used type of pump in pit-and-quarry operations. It is capable of handling large volumes of materials under virtually any head up to 5,000 feet or higher, and at speeds that are standards for electric motors, internal-combustion engines, and steam turbines.

Because of the vastly different materials that it is capable of handling under widely different conditions, there has been developed a large number of different models and types of this pump to meet efficiently the various demands of industries. Consequently, a centrifugal pump may have one or more impellers of any one of three different designs. It may have any one of several different types of casings, and it may be driven by any one of several different drives.

A single-stage pump is one that has only one impeller, as in Figures 1, 2

Figure 1. A non-clogging centrifugal sand-and-gravel pump equipped with a double-row, radial-thrust bearing.

1. Pump Shell
2. Impeller
3. Shaft
4. Hub
5. Hub Gland
6. Suction Disc
7. Hub Bearing
8. Thrust Bearing
9. Shaft Coupling
10. Frame
11. Impeller Key

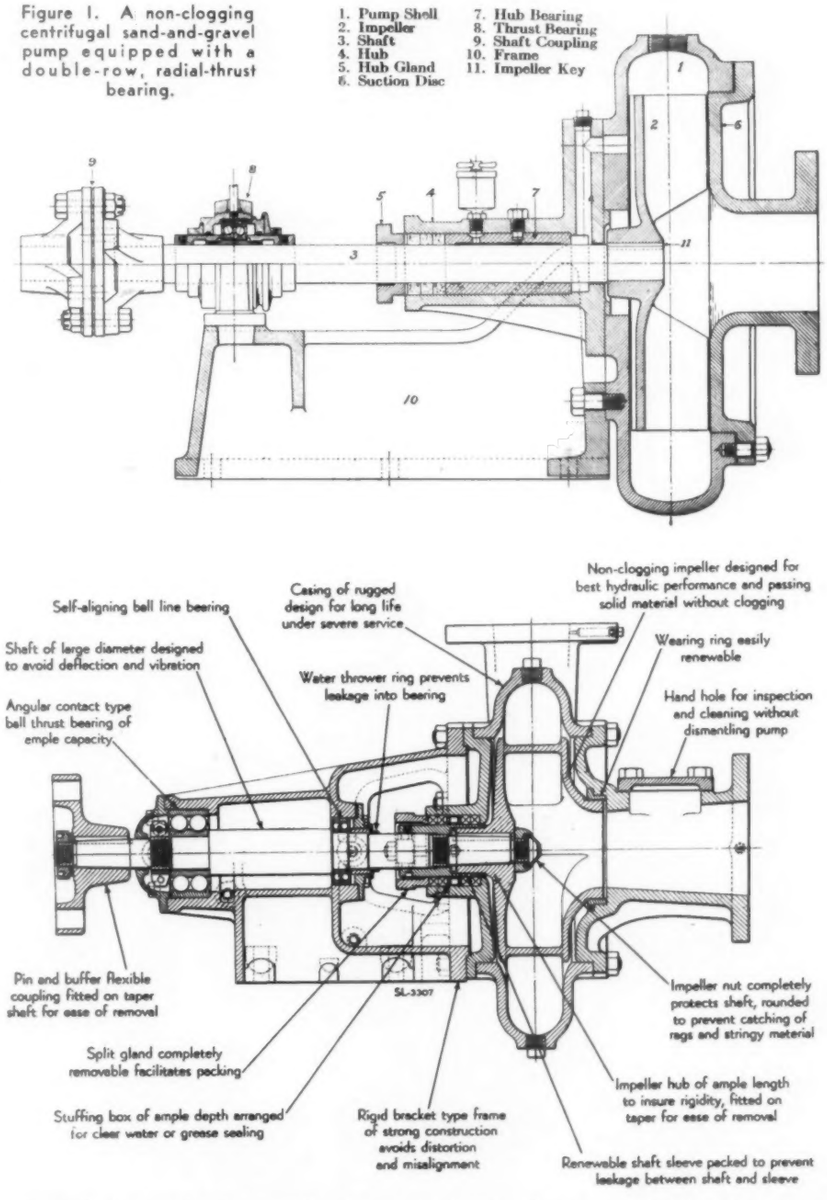
Self-aligning ball line bearing
Casing of rugged design for long life under severe service
Non-clogging impeller designed for best hydraulic performance and passing solid material without clogging
Shaft of large diameter designed to avoid deflection and vibration
Wearing ring easily renewable
Water thrower ring prevents leakage into bearing
Angular contact type ball thrust bearing of ample capacity
Hand hole for inspection and cleaning without dismantling pump
Pin and buffer flexible coupling fitted on taper shaft for ease of removal
SL-3307
Impeller nut completely protects shaft, rounded to prevent catching of rags and stringy material
Split gland completely removable facilitates packing
Impeller hub of ample length to insure rigidity, fitted on taper for ease of removal
Stuffing box of ample depth arranged for clear water or grease sealing
Rigid bracket type frame of strong construction avoids distortion and misalignment
Renewable shaft sleeve packed to prevent leakage between shaft and sleeve

Figure 2. A non-clogging centrifugal pump equipped with grease-packed ball bearings.

and 3. A multiple-stage pump is one that has two or more impellers arranged in series and inclosed in a common casing. Impellers may be of any one of three types: open, closed, or propeller or screw. The open impeller has no side walls attached to the vanes. The closed type has side walls attached to the vanes, as in Figures 2, 3 and 4. Most propeller- or screw-type impellers resemble a ship's propeller in shape.

Impellers may be either single-suction or double-suction. A single-suction impeller has an inlet on one side only, as in Figures 1 and 2, whereas a double-suction impeller admits water on both sides, as in Figures 5 and 6.

Casings may have the form of a flat spiral or snail shell, as in Figures 1, 2, 3 and 4, in which case the pump is called a volute pump, or they may be of the same general shape but have diffusion vanes around the peripheral of the impeller, in which case the pump is known as a turbine pump. Pumps used in pit-and-quarry operations are generally of the volute type. They are also often classified according to the service for which they are designed, as mine pumps, deep-well pumps, dredge pumps, sand-and-gravel pumps, drainage pumps, etc.

In all cases the rotating element consists of an impeller or impellers mounted on a single shaft supported by either plain-journal or anti-friction bearings (ball or roller). Stuffing boxes (see Figures 1, 2, 3 and 4) are provided to seal the shaft at the point or points where it passes through the casing. Slingers, as in Figure 4, are often provided to prevent the entry of water or other liquid into the bearings. In most pumps a thrust bearing is necessary to absorb the axial forces and to maintain the impeller in its correct axial position. Renewable parts are usually provided at points subjected to severe wear.

Lubrication of Centrifugal Pumps.—

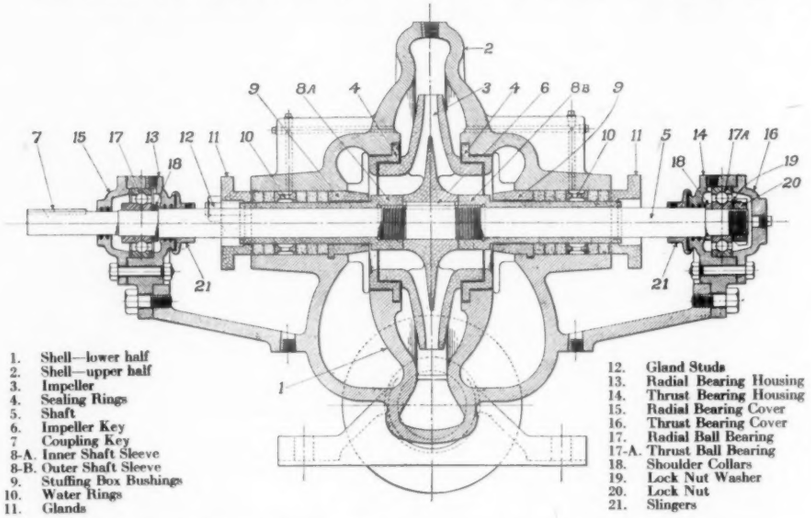

Figure 4. Sectional view of a high-speed, double-suction centrifugal pump equipped with ball bearings and slingers to prevent entry of water into bearings.

There is no metal-to-metal contact between any of the internal parts of centrifugal pumps; hence no internal lubrication is required. The only parts that require lubrication are the external bearings that support the shaft. As all centrifugal pumps operate at relatively-high speeds and bearing pressures are moderate no difficulty is encountered in their lubrication. Ring oilers and sometimes oil cups are used to supply oil to plain-journal bearings. Ball- and roller-bearings are nearly always grease-packed, as in Figure 4.

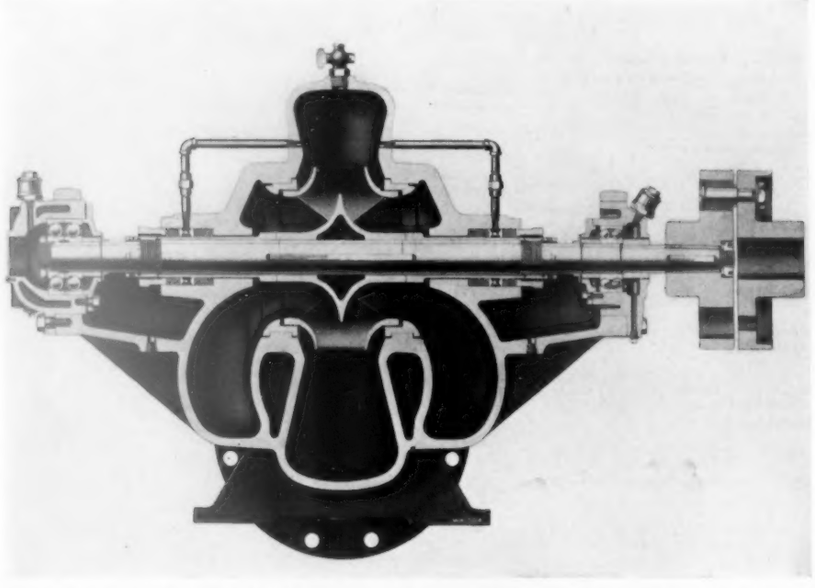

Figure 3. A single-stage, double-suction volute centrifugal pump equipped with inclosed impeller and grease-lubricated ball bearings.

In both ring-oiled plain bearings and grease-packed ball-bearings the lubricants used are expected to give long periods of service without changing. It is necessary, therefore, that the lubricants used be of the highest quality. Oils should be pure mineral oils, highly filtered and neutral, and of the proper viscosities to meet the temperature conditions encountered.

For temperatures below 32 degrees F. it is recommended that an oil having, at 100 degrees F., a Saybolt universal viscosity (S.U.V.) of 150 seconds be used for both plain bearings and ball-bearings for any pump speed. For temperatures from 32 to 140 degrees F. and pump speeds up to 2,000 r.p.m. the oil should have, at 100 degrees F., an S.U.V. of 230 seconds for both types of bearings. For speeds over 2,000 r.p.m. and temperatures from 32 to 140 degrees F. and plain bearings an oil having, at 100 degrees F., an S.U.V. of 150 seconds is suitable. For ball-bearings and these same conditions the oil should have, at 100 degrees F. an S.U.V. of 100 seconds.

For temperatures over 140 degrees F. and speeds up to 2,000 r.p.m. an oil having, at 100 degrees F., an S.U.V. of 650 seconds is recommended for both plain bearings and ball-bearings. For these same temperature conditions but speeds over 2,000 r.p.m. an oil having, at 100 degrees F., an S.U.V. of 400 seconds is suitable for both plain bearings and ball-bearings.

For grease-packed bearings, if no water is present, the grease should be a high-grade, short-fiber soda-base grease of the proper consistency to meet the temperature and speed conditions. A grease of No. 1 consistency should be used for all speeds and for temperatures below 32 degrees and a

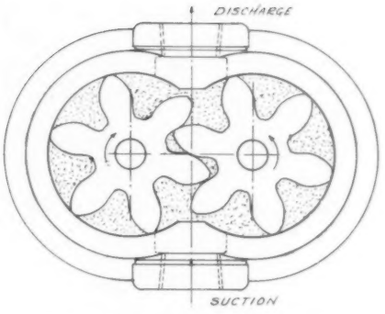

Figure 5. Spur gear rotary pump.

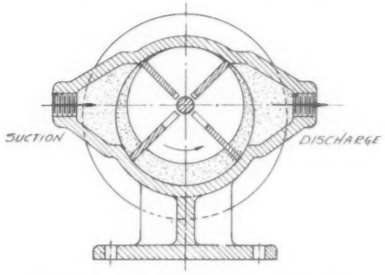

Figure 6. Guided-vane rotary pump.

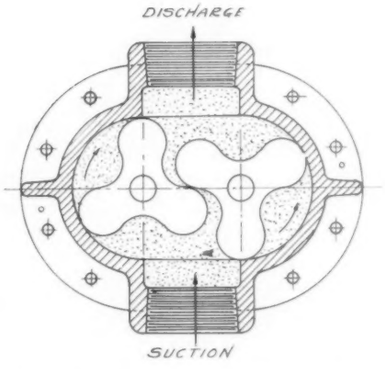

Figure 7. Cam or 3-lobe rotary pump.

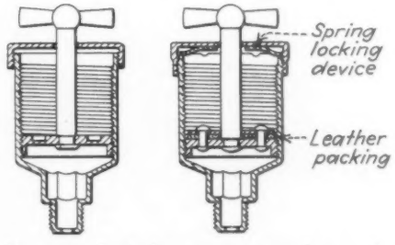

Figure 8. Typical grease cups used on various types of pumps.

No. 2 grease for all other temperatures and speeds.

If water is present, a high-quality, light-colored lime-base grease should be used instead of the soda-base grease.

The Rotary Pump.—The rotary pump operates on the principle of displacement. Its operation differs from that of the reciprocating pump, however, in that the displacement of the liquid in the cylinder or casing is not produced by a reciprocating motion of a piston but by the rotary motion of one or two elements.

Rotary pumps are made in a very wide variety of designs, the most common form being that having two meshing rotors formed as gears, sliding vanes and cams, as in Figures 5, 6 and 7. The rotors revolve in opposite directions, and cause liquid to be drawn into the spaces between them and the casing and carry it around to the discharge side of the pump. These pumps are self-priming generally, combine the constant-discharge characteristics of the

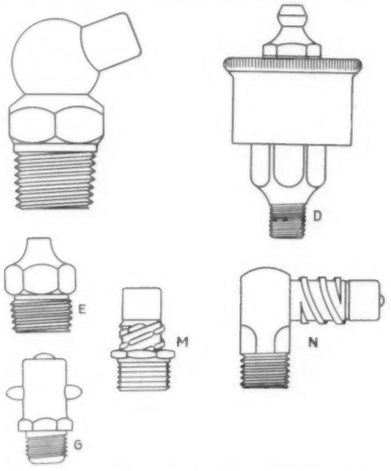

Figure 9. Typical grease-gun fittings. "A" and "E" show fittings for push-type grease gun; "G" shows fitting for screw-plunger gun with bayonet-type coupling; "D" shows fitting mounted on grease cup for filling; "M" and "N" show standard dot-type fittings.

centrifugal type with the positive-discharge feature of the reciprocating pump, and they are valveless.

Rotary pumps of the sliding-vane type, having but one rotor, are also in common use. In Figure 6 is shown one design of a sliding-vane type of pump.

Rotary pumps are built in capacities from but a fraction of a gallon per minute to over 53,000 gallons, and their discharge pressures may vary from 2 to 2,000 pounds p.s.i. They are suitable for handling nearly any sort of liquid, provided it does not contain gritty or abrasive material, which would cause excessive wear of the rotors and housing. The rotary pump is inclosed in a simple casing and the shafts are supported at the ends either by plain journal or anti-friction bearings. Stuffing boxes are employed at the points where the shafts pass through the casing walls.

Rotary pumps are primarily adapted to electric-motor drive, either by direct connection, gearing, or belt. Large pumps of this type, however, are often driven by steam engines, internal-combustion engines, or steam turbines.

In pumps having two rotors the power is delivered to the pump through one shaft only and is transferred to the other shaft through a set of "timing" gears or through the rotors themselves. Most gear rotary pumps have no "timing" gears, as these are used only on the larger and more expensive units where the cost of replacing the rotors would be high.

"Timing" gears not only transmit the power from one rotor to the other but they also maintain the two rotors in the proper relation to each other. Where "timing" gears are used, a clearance of several thousandths of an inch is provided between the rotors themselves and between the rotors and the casing; hence no internal lubrication is required as there is no internal metal-to-metal contact. In designs without "timing" gears, the substances being pumped serve as lubricants.

Lubrication of Rotary Pumps.—In all rotary pumps the external bearings—and "timing" gears, if provided—require

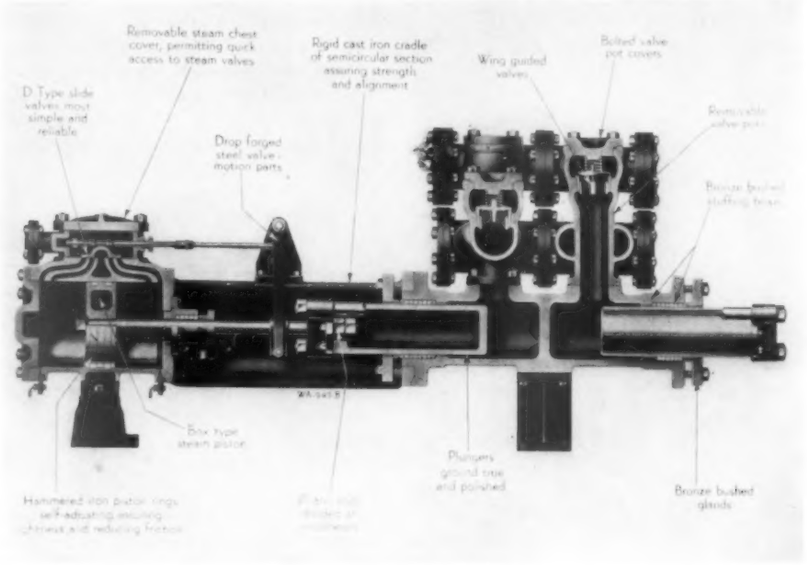
Removable steam chest cover, permitting quick access to steam valves
Rigid cast iron cradle of semicircular section assuring strength and alignment
Wing guided valves
Bolted valve pot covers
D Type slide valves most simple and reliable
Drop forged steel valve motion parts
Box type steam piston
Plungers ground true and polished
Bronze bushed glands

Figure 10. A direct-acting, outside-packed, steam-driven reciprocating pump.

lubrication from an external source. The bearings and gears may be inclosed in either individual housings or a common housing. The gears, if separately housed, are usually bath-lubricated, the bottom of the housing serving as an oil reservoir. If the bearings are ball or roller, they are usually grease-packed, or lubricated by means of grease cups, grease-gun fittings, as in Figures 8 and 9.

Plain-journal bearings may be grease-lubricated by means of grease cups, or wells, or oil-lubricated by means of ring oilers, drop-feed cups, and other devices.

For rotary pumps having grease-packed and ring-oiled bearings the lubricants should possess the same characteristics and qualities as those recommended for centrifugal pumps. For bearings equipped with drop-feed cups or other devices that do not re-use the oil, a cheaper grade of oil may be used, but it should have an S.U.V. approximately 100 seconds more than

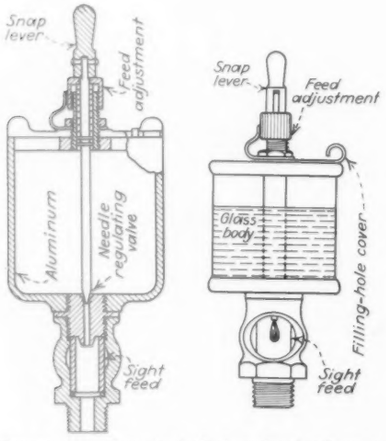

Figure 11. Two typical drop-feed oil cups used on some pumps.

those specified for ring-oiled bearings when operating under the same speed and temperature conditions.

Where bath-lubricated "timing" gears are provided, the oil should be of the highest quality and have, at 100 degrees F., an S.U.V. of approximately 550 seconds. If temperatures are below 32 degrees F., a less viscous oil may be advisable, and if temperatures are abnormally high (over 140 degrees F.) a more viscous oil should be used.

The Reciprocating Pump. — The reciprocating pump operates on the principle of displacement of a reciprocating piston or plunger, as shown in Figure 10.

The reciprocating pump is not as widely used in pit-and-quarry operations as are centrifugal and rotary pumps, as it is not, because of the excessive wear of the internal parts, suitable for handling gritty materials.

In reciprocating pumps, except those

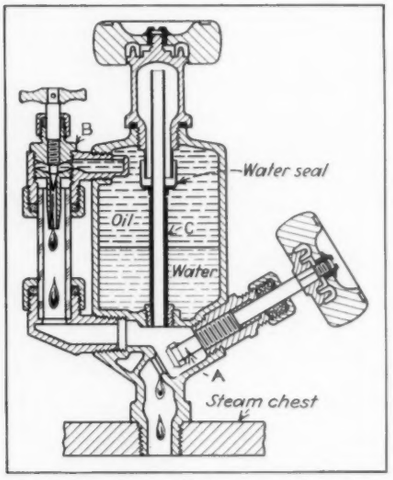

Figure 12. A so-called pressure lubricator for steam cylinders.

driven by direct-connected steam cylinders, the parts that require lubrication attention consist entirely of the external parts, such as crankpins, crankshaft bearings, and crossheads and guides.

All the internal parts of the *liquid end* are lubricated by the liquid material being pumped and, therefore, require no added lubrication attention.

Methods of Lubrication. — Valve gears of steam cylinders are generally lubricated by hand through simple oil holes or by means of grease cups, grease-gun fittings, or drop-feed oil cups, as in Figure 11. Because bearing pressures are low generally and the motion is slight, the simpler types of lubricating devices are all that are necessary. Grease cups, grease-gun fittings and drop-feed oil cups are preferable to simple oil holes as they afford some measure of protection against the ingress of dirt and water into the bearings, and, also, administer a more uniform rate of feed without constant attention.

The lubricant for the internal parts of steam cylinders is generally supplied by means of either a so-called pressure lubricator (Figure 12), a hydrostatic lubricator, or a mechanical force-feed lubricator (Figure 13).

From the standpoint of lubrication, the so-called flywheel or power pump may be divided into two classes: open and inclosed. Open pumps have no housings or covers around or over the external parts and each bearing is individually lubricated by means of devices such as those shown in Figures 8, 9 and 10. Open or exposed gearing is generally hand-lubricated. Inclosed pumps are generally provided with either a circulating or a splash oiling system.

In general, for temperatures below 32 degrees F. an oil having an S.U.V. of 230 seconds at 100 degrees F. is suitable for both plain bearings and ball-bearings. For temperatures from 32 to 140 degrees F. the oil should have an S.U.V. of approximately 320 seconds at 100 degrees F. An oil having an S.U.V. of 650 seconds at 100 degrees F. is suitable for temperatures over 140 degrees F. If the method of lubrication is such that the oil is re-used, the oil should be of the highest grade. On the other hand, if the method of application is such that the oil is not re-used, a cheaper grade of oil may be used and it should possess a viscosity about 100 seconds greater than the above.

For hand-lubricated open gearing a heavy, residual, tacky gear shield having an S.U.V. of approximately 600 seconds is recommended at 210 degrees F.

A No. 2 grease will be found suitable for most grease-lubricated bearings. If water is present, a lime-base grease should be used; if no water is present, a soda-base grease may be used, especially for ball-bearings. In any case the grease should be a neutral product and should not contain any filler, such as talc, rosin, mica, etc.

For the lubrication of the steam cylinders of steam pumps, a steam-cylinder oil having an S.U.V. of from 90 to 100 seconds at 210 degrees F. and containing 10 per cent. compound is recommended. Such an oil should have a flash point of approximately 540 degrees F.

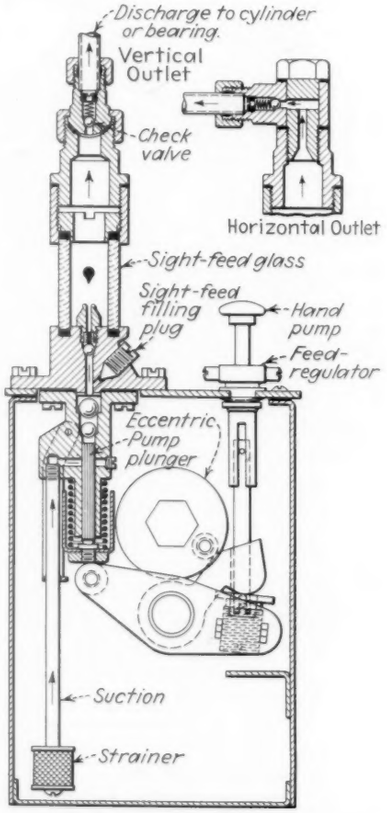

Figure 13. Mechanical force-feed lubrication used for applying lubricants to the internal parts of steam pumps.

This view of the Ralph Rogers plant shows the primary crusher in background and the two reduction crushers. The three small buildings house Diesel engines.

Sets Up Crushed-Stone Plant to Supply Material for Cantonment

ONE of the many army camps which have sprung up in all parts of the country is Camp Forrest at Tullahoma, Tennessee. At the time of the writer's visit early in April there were over 17,000 men at this camp and its capacity of 33,000 was expected to be reached within a few months. Formerly known as Camp Peay, a small National Guard camp, it has now been expanded into one of the largest concentrations of troops in this country.

This expansion took place in only a few months' time and, as one might suspect, there are some interesting stories behind its construction. One of these is in the production of materials for the roads which took the plant out of the mud during the winter. The main roads are concrete but by far the greatest mileage consists of traffic-bound macadam and some black-top. Most of the crushed stone for these secondary roads was produced by the Ralph Rogers Company from a temporary plant located about 6 miles northwest of Camp Forrest. This company has for many years operated permanent crushed stone plants in Bloomington, Indiana and Louisville, Kentucky and has also operated portable plants for highway work in many sections of the Middle-West and South. The stone was produced under a sub-contract from a road contractor and was delivered at the job to the Hardaway-Creighton Company which had the general contract for the construction of the camp.

The production of this stone set a record for this type of operation. Production began on November 11, 1940 and in spite of rain, snow and mud most of the 250,000 tons of crushed stone required was delivered by late March. Operations were carried on 24 hours daily during all kinds of weather. The record day's output was 4,646 tons of stone from 2¾ inches down to dust. Little plant or other trouble was experienced due largely to the company's long experience with this type of work. The plant has been left standing in case other work might come up in this area.

The quarry was developed from a small hillside county quarry and overburden was removed with a shovel. The rock is a hard, stratified limestone with only a few clay seams. Wagon drills were used in 12-foot lifts on the quarry face which reached a maximum height of 125 feet. Stone was loaded into Ford dump trucks by a No. 604 Koehring 1½-cubic yard shovel powered by a Caterpillar Diesel engine.

At the plant the stone was discharged on a Pioneer travelling grizzly feeder from which oversize stone was discharged into the Traylor 28- by 36-inch jaw crusher. Material through the grizzly and the crusher product were carried on a 24-inch by 126-foot Barber-Greene belt conveyor to the top of the plant. There the stone was discharged on a 4- by 8-foot Screen Equipment Company 1-deck "Seco" scalping screen with 4-inch openings. Oversize rock was discharged through a chute into a Pioneer jaw crusher for reduction and then was carried on an 18-inch by 78-foot Barber-Greene belt conveyor.

The minus 4-inch stone through the Seco screen dropped on a 4- by 14-foot Nordberg Symons 2-deck screen. The top deck of this screen was equipped with either 1½- or 2¾-inch openings depending on the product being made. Oversize stone was chuted to a 4-foot Symons cone crusher from which it was discharged on the return conveyor de-

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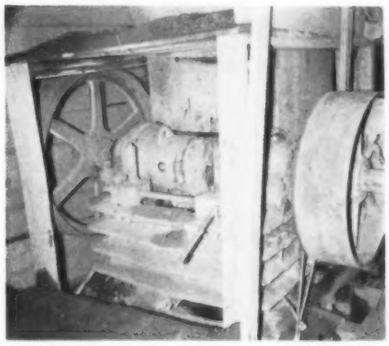
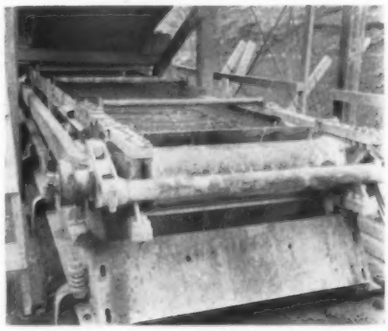


The jaw crusher which reduced the oversize from the scalping screen.

The cone crusher which reduced the oversize from the sizing screen.



The 4- by 14-foot 2-deck vibrating sizing screen.

Cavalcade of Trucks Transports Plant to Job Site

This panoramic view shows the entire plant in operation. Stone is being dumped to feeder of primary crusher at right. In the center is the trailer-mounted scalping and secondary crushing department. At extreme left is the final sizing screen over the truck-loading bins.

THE demand for aggregates created by the defense program and the accompanying general business boom has brought back conditions which many producers never expected to see again. Existing plants are working two shifts in many areas to keep up with the demand and new plants are going up in large numbers. There has also been a sharp upturn in the number of portable plants which are being operated to supplement production from permanent plants or to supply temporary demands in areas which these plants cannot serve economically.

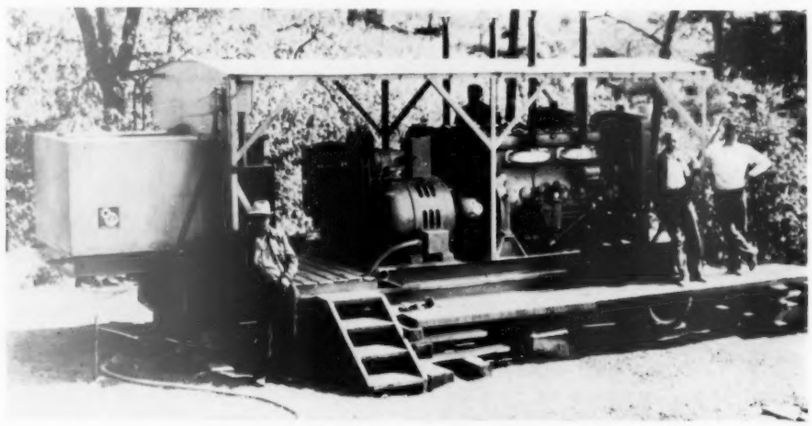
One of the most active of the portable plant operators is the Contractors' Service Corporation of Camp Hill, Pennsylvania, an affiliate of L. B. Smith, Inc., a machinery dealer of that city. The plants operated by this company are of the latest type capable of producing up to 200 tons per hour of sand and gravel or crushed stone meeting the strictest specifications. At present the company is operating two such plants in Pennsylvania and one in New York state.

The New York plant is located at Black River, 10 miles east of Watertown, and is supplying road-surfacing materials for Pine Camp, a cantonment for mechanized infantry which is located at Great Bend, a few miles further east. This 200-ton per hour Iowa Manufacturing Company Cedar Rapids "Morok" plant went into operation on Thanksgiving Day in 1940 and up to April 1 this year had produced over 200,000 tons of crushed stone. Most of this was 2½-inch minus base stone. A daily output of 150 to 200 tons per hour was maintained during this period in spite of one of the most severe winters on record. Snows up to 8 feet in depth and sub-zero temperatures slowed up but did not stop production and Christmas Day with a low of minus 22 degrees F. saw no letup.

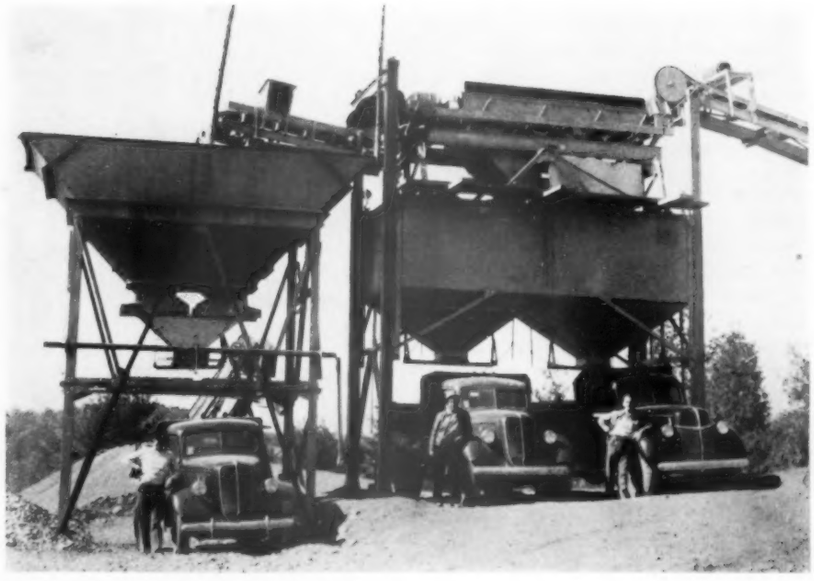
Operation under such conditions undoubtedly set some kind of a record. The moving of this plant to its present location was also a noteworthy achievement. The plant had been operating near Bellefonte, Pennsylvania where materials were being produced for a state highway project. The plant was taken down, hauled 300 miles through mountainous country, set up in its new location and again in operation in a total elapsed time of only 9 days. This was made possible by the fact that the power plant, the primary crusher and the scalping and secondary crushing departments are permanently mounted on trailers and the bins, conveyors, etc., were carried on three special trailers.

The deposit at Black River is a hard limestone with very light overburden. Gardner-Denver jackhammers are used for drilling. Stone is loaded by a 2-cubic yard Thew-Lorain Diesel shovel into three Koehring 6-cubic yard Dumptors.

The stone is discharged to the first unit of the plant which consists of a 42-inch by 10-foot heavy-duty clutch-controlled feeder, a 25- by 40-inch roller-bearing jaw crusher and a 36-inch by 18-foot belt conveyor. This equipment is all mounted on a steel trailer having two rear axles with oscillating beams, dual 10.50- by 20-inch tires, and air brakes. The 100-horsepower Ideal elec-



The portable power plant which consists of two 160-horsepower Diesel engines with generators and control equipment.



The final-sizing screen over the truck-loading bins. A conveyor feeds material to the bin at left.

tric motor which drives this equipment is also mounted on this chassis. The crusher is driven through V-belts and chains from the crusher shaft drive the feeder and belt conveyor.

The second unit of the plant consists of a 36-inch by 41-foot belt conveyor which discharges the rock on a 4- by 12-foot Iowa Manufacturing Company Symons 2-deck screen. Oversize rock goes to a Cedar Rapids 40- by 24-inch double-roll crusher with corrugated segmental rolls. A 24-inch by 26-foot conveyor under the rolls returns the crushed stone on the above 41-foot conveyor. A 36-inch by 10-foot conveyor feeds the material through both decks of the screen on the main conveyor to the final sizing screen.

All of these units are also mounted on a trailer chassis with dual rear axles and dual pneumatic-tired wheels. On it are also mounted the 10-horsepower motor for the screen and the 125-horsepower crusher motor from which the three conveyors are driven through chains.

The 30-inch by 60-foot main conveyor is in three sections for convenience in hauling on a 2-axle trailer. It is assembled on the job and is raised into position by a special lifting device. This conveyor is driven by a 10-horsepower motor and, like all the other conveyors, is equipped with skirt boards.

The main conveyor discharges the material on a 4- by 10-foot Symons 2-deck final-sizing screen on top of a 50-

(Continued on page 51)

The cavalcade of six trucks and trailers which moves the entire plant from one location to another.

ROTARY LIME KILN OPERATING TECHNIQUE

A paper read May 28, 1941, at the annual convention of the National Lime Association, Hot Springs, Virginia

By W. R. CLIFFE

IN recent years so much has been said and written concerning the advantages and disadvantages of this or that length of rotary kiln that the entire procedure seems to be well blanketed with thick fog.

Most of the claims and counterclaims come from manufacturers who are, by and large, good heavy-equipment fabricators. In their engineering departments and shops they have developed to a high degree of proficiency the technique of designing and building rotary kilns, coolers, driers, etc. They have worked out methods of rolling large sheets, of machining, reinforcing, welding, and even X-raying the joints; they have greatly improved bearings, rollers, tires, gears, and innumerable other mechanical phases in the finishing unit known as a rotary kiln. They build such equipment for a very wide variety of users—sludge, sugar, ore, phosphate, cement, magnesite, dolomite, lime, and many more chemical applications. Therefore, by what stretch of the imagination are they qualified to discuss the proper type of kiln to be used, or the efficiency obtainable in any one highly-specialized and technical industry? Yet lime producers have been, and continue to be, willing to place the responsibility for the long-time future performance of their plants directly upon the shoulders of the kiln manufacturers. The lime producer fools only himself if he reasons that, by so doing, he is saving the cost of the engineering. That approach is like the overcoat and the salesman's expense account. "It's there, but you don't see it." Not only is he paying for the engineering, but, generally speaking, he is not getting a well-rounded job because—and I want to emphasize this point—the rotary kiln, in itself, is *not* the criterion of the quality of output or cost of production in a lime plant. On the contrary, it is only a small part in the general scheme of things, and sometimes this single decision is the yard stick by which the success or failure of that enterprise will be measured. True, the kiln weighs more than any other moving part of the installation and, undoubtedly, represents the greatest single outlay in cost, but it is still *only one link in the chain.*

The point I am trying to make is this: We generally think of the rotary kiln as being the medium that brings about the desired results. In the older plants this belief is about true, but in the successful modern installation it is far from correct. The rotary kiln is just one spoke in the wheel, which, along with proper draft control, feed uniformity, recuperators, heat exchangers, refractory refinements, insulation, rotation speed, combustion control, air and gas velocities, heat recovery, instrumentation, intelligent operation, etc., produces pebble lime the effective way. The same is true of pre-heaters, deheaters, pulverizers, and coolers. Every one of them is important and worthy of much consideration, but only to the extent of its contribution to a well-balanced combination.

Operators have installed unit coal pulverizers, and sometimes the anticipated results have not materialized according to expectations. Much greater flexibility is usually attained, but manufacturers' promises of improved coal-to-lime ratios are ofttimes hard to find. This condition is to be expected. The excellence of the coal mill is not questioned, but after all it takes so many heat units to perform a task under a given set of conditions. The mill can perform that one function, and that is all. Don't blame the manufacturer of the coal mill. The chances are about 99 to 1 that the mill is doing all that can be expected of it. Blame yourself for not making the detailed study that is required before the desired reduction in coal input can be obtained. The same is true of the rotary kiln, the induced-draft fan, dampers, heat exchangers, insulation, refractory refinements, preheaters, deheaters, instrumentation, etc. Individually, the contribution of each toward quality and efficiency is sometimes disappointing, but, collectively, functioning in a state of balance, an entirely different picture presents itself.

The quality of output and efficiency of operation of a number of long rotary kilns is far from encouraging. While the short lime kilns installed fifteen to twenty years ago are, with very few refinements, burning a ton of lime to-day, with 8,000,000 to 9,500,000 B.t.u.'s, most of the elongated members of the same family are doing but very little better. You ask why? I answer, simply because the temperature of the exit gas from most long rotary kilns with insulated lining is approximately the same as that of the products of combustion being exhausted from the short rotary kiln. You can't push your money up the chimney 24 hours a day and have it, too.

From the foregoing I hope I have qualified my contention that our constant reference to the rotary kiln (whether it be long or short), as the instrument through which modern quality and efficiency are attained, is a misconception.

From experience gained in the operation of short rotary kilns two outstanding weaknesses in that practice become apparent. The first and most important, the one which has caused much trouble in both the chemical and the building fields, is the almost universal tendency to overburn the lime. The second is the low fuel efficiency.

Most of us know the reasoning behind the application of the rotary kiln to the lime industry. Years ago it seemed to offer a medium for the disposal of the sizes of stone too small for burning in the vertical kiln. (Those were the days before Mr. Azbe had successfully demonstrated that the burning of quarry or mine spalls in the upright kiln was practical.) In our innocence we tried to feed these spalls as such, and to our consternation we learned that, in order to bring about fairly complete calcination of the smaller sizes, we had overburned the larger particles to a clinker. Gradually we observed how the larger particles, always rolling on the outside of the charge, were constantly exposed, either to the direct heat from the flame or gases or to the heat from the refractory lining. Soon we found that a complete segregation had taken place, with a definite size at a given depth in the rolling charge, with the finest particles confined to the very core of the mass. In order to reach this size we were overburning the greater percentage of the output. First, we tried to screen out the smaller sizes, which often left 20 or 25 per cent. of core in a slaking test. The weakness in this approach to the problem soon became apparent as inventories of a product that was neither lime nor stone began to pile up. Of course, this partially-burned product could be used in a hydrator, if it were equipped with a tailings throw-out feature, but it definitely broke down the analyses, if used in a ground or pulverized caustic products, so we were up a blind alley here.

Apparently the answer rested in uni-

formity of kiln feed. Therefore, stone screening facilities, in varying degrees of elaborateness, were installed, until, after scalping the plus 2-inch and removing the minus ¼-inch, we broke the range from plus ¼-inch to minus 2-inch into as many as six distinct sizes. We tried to make kiln-feed sizes correspond with various state highway specifications, and found this impractical, so that the stone-preparation phase of most rotary-kiln plants became a maze of intricacy, with mounting costs naturally following.

Have we eliminated overburning? Hardly. We have come a long way, but the problem is still an acute one. Even though the excellence of our screening facilities is beyond question, we experience breakage in the kiln, due to moisture content in the feed stone. Also, attrition is an important factor, especially in long kilns, more particularly where complicated heat exchanger systems are employed. It seems that sudden admission of feed stone, from atmospheric temperature into relatively-high temperatures, is conducive to cracking. Limestone that will hold its approximate original size in an upright kiln will often be reduced to slivers or powder in a rotary kiln. At any rate, any one or a combination of reasons given is sufficient to greatly reduce or destroy the fine uniformity of size, which was brought about by accurate screening just prior to injection into a rotary kiln. Thus, after all our effort, we often have a product irregular in size, which is an important factor in overburning. It might be well to mention at this point that operators have sometimes been disappointed with the reaction of their stone, which completed passage through a vertical kiln without serious breakage but, when exposed to treatment in a rotary kiln, broke down to a powder. Such a condition naturally destroys the most carefully laid plans, and requires an entirely different method. Therefore, it is good to establish the character of the stone to be burned before deciding on any particular form of treatment.

With a knowledge of the relation of overburning to segregation the long kiln seemed to offer decided advantages, because it embodied an increased time factor. Surely, longer exposure to relatively-high temperatures would minimize the necessity of excessive heat in the actual calcining zone. One would naturally expect to find calcination well advanced as the charge enters the final stages, but, believe it or not, in most instances where long rotaries have been employed calcination is no further advanced at, for the sake of argument let us say, a point 80 feet from the discharge end of many kilns of more than 250 feet in length than it is in a 175-foot kiln. This statement is not the result of one experience; on the contrary, it is based on many observations conducted in several different ways.

Well, you are justified in saying: "What is the use of putting in a long rotary kiln"? and I say to you, without hesitation: "No use; unless you employ heat exchangers in it, or unless your material is so fine in size as to make the passage of the products of combustion through it impractical in a preheater, or if electrical rates are so high that the cost of operating a relatively high powered exhauster offsets the savings in coal."

Therefore in the first and most important phase, the elimination of the overburn, the long rotary kiln has failed to make its expected contribution.

Now, let us consider the state of fulfillment of the second phase of expectancy from the long rotary kiln—that of fuel economy.

In our initial experience with rotary kilns we built them from 125 to 175 feet in length. The only reason for the second odd figure was that the stress sheet indicated it to be the longest revolving tube that could be supported on two bearings with safety. Most of these kilns were fired with producer gas. The only control was obtained through varying the speed of rotation, and the draft was natural with crude dampers infrequent. Under this arrangement exit-gas temperatures were in the neighborhood of 1,400 degrees F. and production rates ran anywhere from 80 to 160 tons of good lime per day. Under this arrangement the coal input was on a basis of approximately 9,300,000 B.t.u.'s per ton of lime. These bare kilns cost in place (lining included) about $345 per foot of length.

In later years kilns in some instances more than twice the length of the longest two-bearing old timers were installed. These units have modern unit coal pulverizers for direct firing. They are insulated and some have induced draft. Their exit-gas temperatures run from 1,200 to 1,400 degrees F. The cost of the bare kiln in place (lining and insulation included) was about $400 per foot of length, and they require approximately 8,000,000 B.t.u.'s to calcine a ton of high-calcium lime.

Assuming an average bituminous coal to cost 15 cents per 1,000,000 B.t.u.'s at the plant, a saving of approximately 20 cents per ton of lime, over their 20-year-old brothers, is effected.

Let us assume, for the sake of argument, that the average rotary lime kiln produces approximately 50,000 tons per year. On this basis the yearly saving, resulting from the improved coal ratio, would be in the neighborhood of $10,000, but, as a 300-foot bare kiln in place (including lining and insulation) costs about $120,000, six years would be required for the coal savings to offset the added capital investment without taking into consideration the increased maintenance cost of the longer unit.

The average maintenance cost (labor and material) on the short kiln of earlier design should be about 15 cents per ton of lime produced; this does not include slag-formation removals. If a kiln is producing in the neighborhood of 50,000 tons of lime per year, this would be about $50 per linear foot of kiln. This is a fair average because of the added difficulties which accompany the placement of insulation, especially in unriveted kilns. Therefore, as the output of the long kiln is not appreciably greater than that of the shorter type, the maintenance rate (labor and material) will be about double, or 30 cents per ton of lime produced. Consequently, 75 per cent. of the 20-cent per ton fuel saving is offset. With 5-cents per ton margin, if the 50,000-ton yearly production rate can be maintained, 24 years will be required to compensate for the additional $60,000 of capital investment out of fuel saving, and most equipment and technique becomes, of course, obsolete in such a space of time. I leave you to judge the justification for the long rotary kiln without special equipment.

From the beginning of my discourse I have been trying to draw a comparison between the typical 150- or 175-foot kiln, as most of us know it, and the newer rotary kiln (without special equipment) of 300 or more feet in length. Now, I will attempt to describe some of the advantages and disadvantages of the long kiln with refinements, special equipment, and operated under proper control. Also, I will touch briefly upon the nature of the refinements, which are, in large measure, responsible for the efficiencies attained.

Previously, I made the statement that exit-gas temperatures from long insulated rotary kilns are approximately the same as in the 175-foot kiln. This is correct theoretically as well as practically. The only possible way of reducing this is through the application of heat exchangers or some similar device. Naturally, these are placed in the feed end of the kiln. The reason for the location is to minimize the exposure of metal to the relatively-high temperatures (heat-resisting alloy steels have well-defined limits), and, of course, to advance the state of calcination as far as possible in the introductory stage of the process. This principle employs many types, but the theory is that, by providing a multiplicity of surfaces, the

charge, thus subdivided in intimate contact with the metal, will allow a more rapid transfer of heat from the gas to the metal to the stone than would be possible with a single rolling charge and only occasional contact between the hot gases and the stone. Properly-engineered heat exchangers will reduce the temperature of all the products of combustion from 1,200 to 1,400 degrees to 600 to 700 degrees. Thus, a very great waste is materially reduced. This one feature constitutes the chief advantage. Against this, I must call your attention to the disadvantages which, in the interest of brevity, I list as follows:

1. The minimum first cost of a complement of heat exchangers will be at least $6,000.

2. Part of the system is of chrome-nickel steel, which is at present extremely difficult to obtain.

3. The receptacles for attaching the exchangers to the shell of the kiln greatly complicate the placing of the lining, materially adding to the cost and increasing the possibility of failure.

4. Exchanger elements sometimes break loose, playing havoc with other parts of the system and wrecking the lining.

5. A system of heat exchangers adds decidedly to the maintenance cost.

6. Unless special provisions are made, they materially increase the wear on the brick lining.

7. When repairs to the lining or intermediate sections of the system are required, it is generally necessary to remove many, or all, the heat-exchanger elements—a very big job.

8. If stone is soft in character, passage through a heat-exchanger system increases the breakage and attrition losses.

9. Heat exchangers invariably are the factor limiting the production rate; progress through the system is slowed down.

10. The movement of the charge through the system, being none too gentle, aggravates the dust loss.

To summarize: while heat exchangers are an abomination to the operating man, yet, in spite of all the points I have made against them, they are justified by their contribution to the general effort toward thermal efficiency.

Another important feature in the improved technique, which is contributory to the excellent fuel-lime ratio being obtained in some of the long rotaries, is the item of draft control. The ability to maintain positively even exit-gas temperatures, to extend or shorten the temperature zones at will, to alter the secondary air in movement to a nicety, to apply proper temperatures corresponding to stone feed sizes as they are changed—all these things add very greatly in obtaining maximum value from fuel input. Here again, I call attention to the fallacy that the kiln proper is the criterion of achievement.

Insulation of the lining is important. Not very much work has been done in the insulation of calcining zones to date, but advanced thought in this direction is the rule, and I do not think it will be very long until we have something of major importance in this connection to announce. Here is where the greatest savings are to be made, but, because of the immensity of the obstacles, progress is slow. In the intermediate and cold zones, where the bricks' outer-face temperatures do not exceed 1,000 degrees, savings up to 800,000 B.t.u.'s per ton of lime burned are being effected.

Improvements in refractory practice offer advantages for consideration.

Proper pulverizing and control equipment, where powdered coal supplies the heat, has contributed in large measure to present-day successes. We can not look in this direction for much additional assistance. Realization will lie in utilizing to the utmost the heat value supplied by the mills. Of course, there are many details in connection with fuel and combustion, just as is the case in other subjects touched upon, which are of particular interest to operators, but time is not available for their discussion.

By utilization of many of the improvements herein touched upon some operators are to-day burning a ton of lime with 320 pounds of coal. Even with this thermal efficiency the ceiling is still nowhere within sight. I fully realize that many of you will question such coal-to-lime ratios, but the fact remains that they exist.

For some years there seems to have awakened, in those of us engaged in the business of burning lime, a consciousness of the value of the products of combustion, which are being exhausted through the chimney to the atmosphere 24 hours out of every day. But thought in connection with the more important possibilities at the other end of the kiln has still not crystallized. I have in mind the efficient and effective cooling of lime. Since the early 1920's I know Irving Warner has been aware of the possibilities. Therefore, the idea is not new. Some attempts have been made in this direction, but to date the surface has not even been scratched. However, at this time a plant which I predict will go far in this respect is in process of erection in the Southwest, and it is hoped that preliminary figures of accomplishment will be available late this year. This treatment should not only offset the seriously derogatory effect of overburning, upon which I commented at considerable length in the beginning of this paper, but it will also minimize slag formation, economize on fuel, and, last but by no means least, it will cool lime as it should be cooled, very slowly.

Here again, because heavy-equipment manufacturers happened to make coolers for a multiplicity of uses, we have tried, at great expense to ourselves and our product, to utilize them. Here, again, it is attempted to bring to your attention the fallacy of the existing belief that the rotary kiln, long or short, is the all-inclusive factor in lime burning.

Domestic Asbestos Sales Reach Record Levels

Sales of domestic asbestos attained an all-time high of 20,060 short tons in 1940, an increase of 30 per cent. over 1939 which was a record year, according to the Bureau of Mines. Their value was 32 per cent. greater than in 1939. Consumption was 3 per cent. greater than in 1939, but 17 per cent. less than in 1937. Sales from domestic mines amounted to only 8 per cent. of domestic requirements and since asbestos produced in the United States is predominantly of the shorter grades, domestic production of the longer and more essential grades is considerably less than 8 per cent. of requirements.

During recent years there has been a marked increase in imports of asbestos from Africa. Some of the African fibers are interchangeable with Canadian fibers, and compete with them on a price basis. Other kinds, particularly the amosite and blue asbestos, obtainable in quantity only in Africa, together with certain grades of Rhodesian chrysotile, are used for special products for which no other fibers are suitable. Consequently, it is highly desirable that imports of such kinds and grades should continue.

The famous asbestos deposits of Quebec, Canada, have for many years furnished the United States with a large part of its supplies of both long and short fibers. Imports from Canada were a little higher in 1940 than in 1939. As Canada has lost all of her continental European asbestos markets there is no shortage of supply available for United States needs.

During recent years domestic production has been centered chiefly in the extensive deposits of slip-fiber near Hyde Park, Vermont. Amphibole asbestos, because of its resistance to chemicals and high temperatures, is well adapted for certain special products such as acid filters and coatings for welding rods. Small quantities are shipped from various states. During 1940 there was a growing demand for information on new sources of supply of high-grade anthophyllite and tremolite.

Modern Electrical Detonation

By PAUL C. ZIEMKE

THE introduction of electricity to the art of blasting is by far the greatest advancement that has been achieved in recent years. The successful application of this comparatively new method has been made possible by the development and perfection of instantaneous and delay electric detonators.

Several factors that make for greater reliability and certainty of complete detonation, as compared to blasting by fuse, are found in the fact that with simultaneous detonation of all charges the hazard of leading shots cutting off succeeding shots is completely eliminated. A distinct advantage also is the fact that the tamping material may be more densely compacted than when fuse is used. The pressure of the tamping material on the fuse often slows down the burning speed, or cuts off the trail of fire. Eliminated also is the possibility of the explosive charge being ignited by sparks given off by the burning fuse. The insulation of the electric-detonator shell and its attached leg wires against the intrusion of water is also much more readily accomplished than is the case with fuse and fuse caps.

The preparation of an underwater blast, also in a deluge of rain and wind, can therefore be accomplished with speed and safety. Frigid temperatures, too, have no deleterious effect on electric-detonator wires, as compared to fuse being rendered brittle and readily susceptible to breakage.

In large quarries using the well-drill method the detonating fuse is practical, but in quarry operations where small machine holes are used greater economy of explosives and better fragmentation are obtained when a large number of holes are fired together and, in addition, more broken rock is laid on the quarry floor at one time. The advantages of this method of firing blasts are many, and the probability is that the passing of time will see a still greater adoption of the practice.

Current Requirements.—For electric blasting we have two sources of power: the portable blasting machine, and the electric-power line. Since the basic requirement for a successful electric blast is the securing of the passage of an equal and sufficient amount of current through each electric detonator at the same instant, let us analyze this requirement.

Blasting-Machine Capacities.—Portable blasting machines of either the hand or the spring-operated type, producing current at rated capacity, have a current output varying from 1.4 amperes to 1.8 amperes over a discharge time interval of 0.02 second, this factor varying with the resistance values of the detonators, their leg wires, and the lead wires.

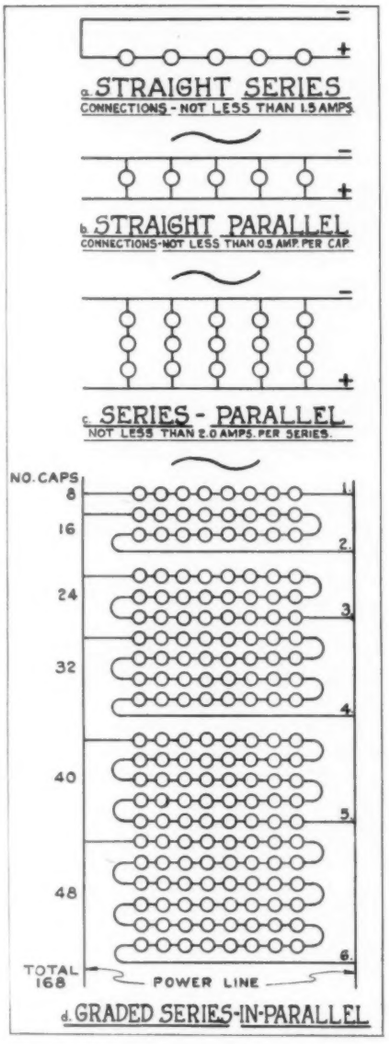


Figure 1.

Assuming, then, that all the factors tend to produce series circuits of relatively high resistance, the resistance values being accumulative, the voltage produced is sufficiently high to force a current of 0.8 ampere through the circuit. Thus, with a comparatively high voltage potential, and a correspondingly limited ampere output, blasting machines are strictly limited to firing a straight-series circuit, with the single exception of the graded series in parallel circuit, which will be discussed later (Figure 1). In any series the amount of current flowing through each detonator is proportional inversely to the resistance of that circuit; thus, the firing of a detonator results from the heating effect of the current and this varies as $I^2 R$, in which I is amperage and R is the resistance of the bridge wire. The average electric detonator requires ½ ampere of current to heat the bridge filament sufficiently to ignite the priming charge. Series-connected detonators require a current of 1½ amperes in volume with 2 volts figured per individual detonator.

Eliminating Electrical Faults.—Experience, gained through long years of analyzing electric-blasting failures, proves that fully 90 per cent. of the misfires occurring are due to electrical faults. Usually these troubles are readily traced to one of the following causes: insufficient current, ground leakage, and uneven distribution of current. Here the rule applies that whenever electric detonators fail to fire, but are exploded by a second application of current, the trouble was of a certainty purely electrical and the difficulty can usually be found to lie within the above-outlined causes.

Insufficient Current.—A blasting machine must be operated with full force to produce the full rated output of current. Failure to do so is quite often the cause of faulty detonation. The use of heavy oils that congeal in cold weather, preventing even a strong man from operating the machine with due force, is also poor practice; however, it is met with frequently. Periodic tests with a rheostat to determine the state of repair of machine is a highly recommended practice.

A fact well known to most explosives men, and of sufficient importance to mention here, is the rule never to attempt firing the detonators of several manufacturers in the same series circuit. This is readily explained in that slight variations in the size and composition of the bridge wires will have an appreciable effect on the current, thereby exploding the most sensitive detonators first, while the less sensitive ones fail to explode at all.

Ground Leakage.—Current leakage from straight series-connected circuits has more serious effects than when it occurs in a parallel-connected circuit, one reason being that there is no such thing as a perfectly insulated blast circuit. The relatively higher resistance of a series circuit causes the firing cur-

rent to seek every path of leakage present in the chain of detonators.

Referring to the diagram (Figure 2) developed by engineers of the U. S. Bureau of Mines, it is apparent that, as the current enters the series, a portion immediately seeks a shorter path of less resistance by flowing through the wet earth, rock, and other conductive elements present. This leakage (in or out of the circuit at any point) is the result of voltage differences or electrical pressures between different points of the shot-firing circuit. Obviously all the leakage from the first several holes is out of the circuit, while all the leakage at the last several holes is into the circuit. Under such circumstances it is readily apparent that the center holes have been more or less by-passed by the current and consequently failed to fire.

We, therefore, find that in series-connected detonators the flow of current ceases the instant the first bridge wire opens. The time period between the application of the firing current and the opening of the series circuit, by the breaking of one or more of the detonator bridge wires, depends upon the strength of the current flowing in the wire circuit and the sensitiveness of the detonators to the current. Detonators, then, should be of the waterproofed type with enameled leg wires, covered with several layers of tar-impregnated cotton, and are to be all of the same manufacture (as previously mentioned).

Grounded Power.—The foregoing discussion on leakage dealt primarily with firing current obtained from portable blasting machines. With electric power everywhere coming into general use machines are no longer used except possibly for shots beyond the reasonable reach of a power supply. This alternating-electric current usually has one phase grounded as a precautionary measure, as is required by electrical codes. The same grounding of the current, unless corrected for blasting purposes, is the cause of a leakage condition even more aggravated than is the case with current from blasting machines.

Not only is the same condition of leakage out of and into the wire circuit present, but there is also the tendency for the current to seek a low resistance path through earth, water, and rock formations back to the point of attachment between the power source and the ground. The three wire power supplies indicated in the upper section and to the right of the drawing on current leakage (Figure 2) graphically illustrates the flow of current as it by-passes various detonators.

Current Transformer. — A reliable and economical means of maintaining the required grounding of light and power circuits, and at the same time furnish ungrounded current for blasting, is to install a small transformer of the dry type (not immersed in an oil-filled tank) in a size ranging from 1 to 10 kv.-a., depending on the load requirements.

This transformer of a 1-to-1 ratio (equal number of wire turns in both primary and secondary winding) is coupled to either the light or the power mains where uninterrupted power is maintained. The output side of this transformer obtains current free from ground through the inductive coupling of the transformer core; thus, is eliminated a prolific cause of current leakage in the blast circuit.

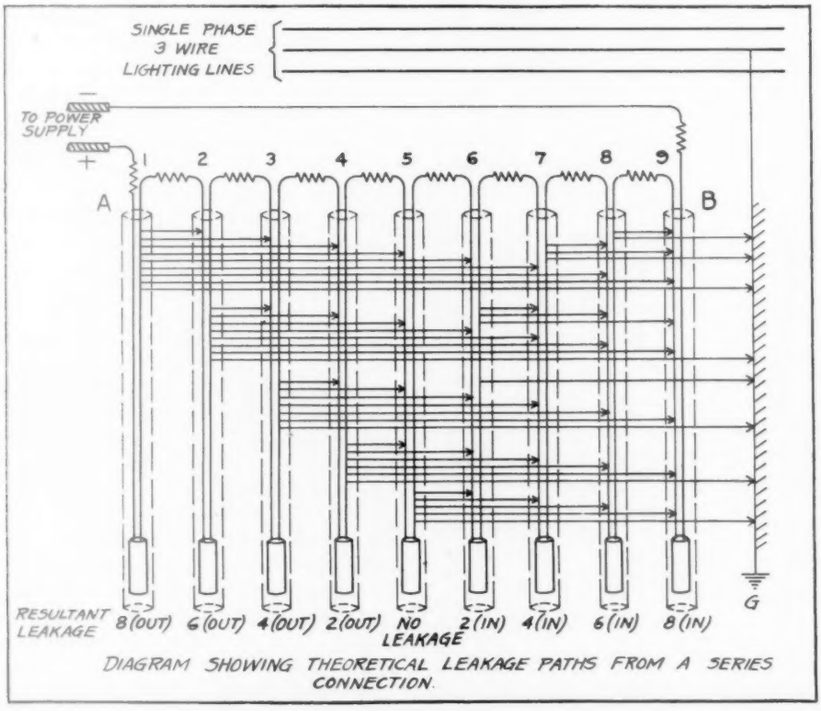


DIAGRAM SHOWING THEORETICAL LEAKAGE PATHS FROM A SERIES CONNECTION.

Figure 2.

Parallel Detonator Circuits.—When power is available, practically no advantage is gained in employing the series circuit, since current limitations are no longer a factor. Perhaps just two exceptions may be mentioned: often a series circuit can be connected more speedily than a parallel circuit, and, when completed, is more readily and accurately checked for completeness of circuit by means of the galvanometer.

Both advantages, however, are more than offset by the parallel circuit in that no concern is had because of slight variations in the resistance values of the detonators, each one being coupled directly on the main circuit and source of power, instantaneously drawing sufficient current to heat the wire bridge. While some leakage may be present due to faulty insulation, unless the condition is aggravated all the detonators fire with uniform regularity. Some current may by-pass but, as a rule, it is of no serious consequence, since each detonator connected to two power wires adds an additional path of return for the current, whereas in the series circuit each additional detonator increases the resistance for the current to overcome.

The "Bo Hunk" Connection.—When connecting detonator leg wires to the blasting line, a good practice is to connect one wire of each pair to the No. 1 wire of the line as the tamping of each hole is completed. Then, as the loading operations are finished, it is but a moment's work to check each remaining leg wire against the second wire of the main line for continuity of circuit. When all the remaining leg wires are checked and connected and the splices are dipped in molten tar (to insulate them from the ground and each other), the shot is ready. By conscientiously following this method skipped leg wires are detected and all the holes are checked by a galvanometer; also eliminated thereby is the possibility of connecting both leg wires of a pair onto one main line wire. Fortunately one well-intentioned manufacturer has identified each leg wire by a covering of colored insulation; hence the name "Bo Hunk" connection, where even the veriest tyro connects all the red wires to one main line, and all the yellow ones to the second main line.

The Blasting Switch.—A good blasting switch, properly designed and constructed, is a very necessary adjunct to

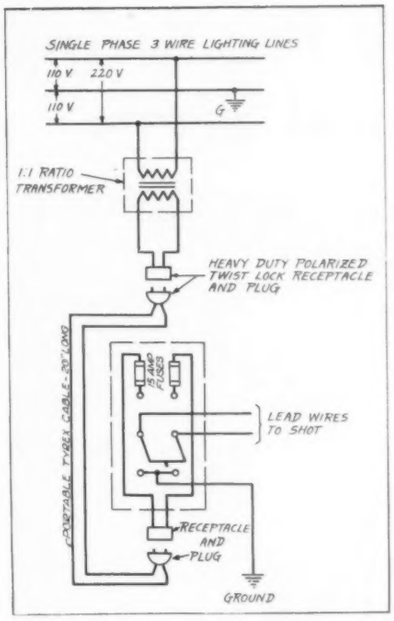


Figure 3.

good blasting equipment. A switch which has been widely accepted and prescribed by law in several states, is a double-pole double-throw switch—of ample capacity to withstand the hard knocks of daily service (Figure 3). This switch is mounted in either a wood or a metal cabinet with a baffle fastened to the inside of the door. This baffle prevents the door from being closed or locked while the switch is in the "up" or firing position. The switch blades must, therefore, be in the "down" or short-circuited and grounded position.

The bottom switch clips are short-circuited through a wire or copper strap, and a No. 6 wire binds them securely to a low-resistance ground rod. The upper switch clips are improved, from a safety standpoint, by squeezing and soldering each clip solidly to its mate. Thus blocked, the switch can be kept in the firing position only by the force of the blaster's hand. By this means a blaster can not in the excitement of the moment should a blast fail to fire—leave the switch in the "up" and firing position to go out on the charge and locate a faulty connection.

An added feature is the method by which power is applied to the upper switch clips. A heavy-duty service outlet terminates a power line at the upper side of the switch box. Located at the lower edge of the box is a similar outlet, which is wired to the upper switch clips. To energize the switch for blasting a short section of duplex rubber cable (with plugs attached) is used to bridge the gap from the service outlet to the switch outlet. This cable —permitted only in the possession of the blaster in charge—is an added safeguard should the box lock be tampered with.

The Blasting Line.—Investigations of numerous blast failures have caused the writer to take a definite stand against the use of the ordinary duplex lead wire. This wire, after several weeks of hard use common to quarry work, invariably shows serious deterioration of the insulation, permitting moisture to penetrate and thereby cause serious current leakage from wire to wire or to the ground. Numerous amateur splices may also add greatly to the resistance. All factors combined are the cause of insufficient current flow.

Pictured herewith is an efficient cable reel mounted on the wheels and axle of a discarded buggy. This reel mounts 700 feet of stranded No. 12 gauge duplex wire. Each wire is thoroughly encased in live rubber; the two wires then are twisted for greater flexibility and the interstices are filled with hemp to round out the form; finally a heavy outer covering of live latex rubber covers the whole. This type of line will render many years of service under severe conditions in all sorts of weather. It is flexible and non-kinking due to the twist in conductors and the high grade insulation.

The Graded Series in Parallel Circuit.—This article on electrical blasting methods would not be complete without mention of the graded series in parallel circuit. The new connection is of great value to isolated projects where only blasting machines are available or where an exceptionally large number of detonators would overtax the available electric power.

The principle upon which this circuit operates is as follows: In any series the amount of current flowing through each detonator is inversely proportional to the resistance of that series. Thus, where we have a number of series increasing in number in even increments of 8 or 10 detonators, the first series, having half the resistance of the second, takes twice as much current, three times as much as the third, and so on up to the last series.

Since the heating effect varies (as the square of the current), four times as much heat is produced in the first series as in the second, nine times as much as in the third, and finally up to 100 times as in the tenth series. As we apply current to this graded series in parallel circuit the current begins to flow through all the series. The lowest series, having the least resistance and the greatest heating effect, fires first; and as each series fires progressively, a great amount of current is made available for the remainder of the series groups.

All the detonators appear to fire simultaneously; actually there is a minute time interval between the various series. Short as this interval may be, it is sufficient to overcome any irregularities in firing which might occur due to variations in the sensitivity of the detonators. Several combinations, such as 15-30-45 and 5-10-15-20, have been fired consistently. The important fact to be remembered is that the largest series can not safely exceed the rated detonator capacity of the blasting machine or power supply.

The Testing Galvanometer.—Successful electrical blasting depends to a large degree on the diligent and painstaking use of the galvanometer, for without the services of a galvanometer one is completely at sea, not knowing whether a circuit is closed or open or whether poor wire splices are present to increase resistance and limit current flow. Neither can one determine the degree of ground leakage present—a vital factor, indeed, in view of the definite assurance that a blast will result in a partial misfire when galvanometer readings indicate less resistance from the blast circuit to the ground, as compared to a test through the blast circuit proper.

An expedient method of making the ground-leakage test is to use the main blasting line as contact to the ground. This line, described in the foregoing text, is ground connected at the locked blasting switch. Lacking a grounded blasting line, one can substitute by dropping a long drill steel into a water filled hole or by driving a ground rod in reasonably moist earth. Conscientious use of the galvanometer will detect wiring defects, unbalanced crossed or open circuits, and ground leakage in sufficient time to correct them long before the "zero" hour of blasting time.

"Make Haste Slowly" and Exercise Good Judgment.—Entirely too many blasts fail to accomplish the expected results, and often expensive accidents are due to hurried slipshod methods being employed. Safety and efficiency are so closely allied that they are well-nigh inseparable; we can not have one without the other. Efficiency and safety can only be realized when each individual is thoroughly instructed in his duties.

A simple reel cart easy to move about. It carries 500 feet of rubber-covered duplex stranded wire.

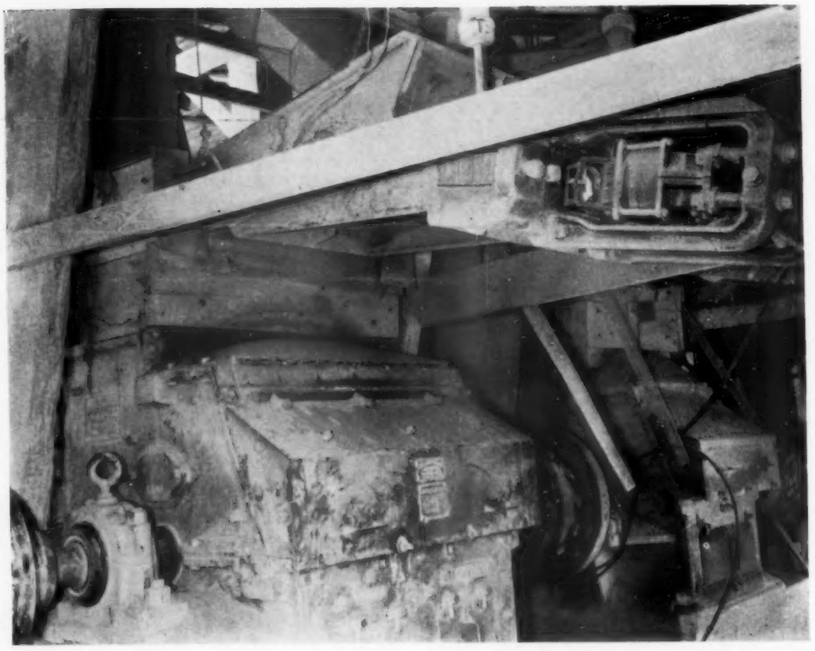
Kentucky's Crushing Plants Producing Large Volume of Agricultural Stone

ONE of the most important developments of recent years for producers of crushed limestone has been the rapidly-increasing demand for agricultural limestone by farmers... Before the depression, farmers had begun to realize the value of limestone and demand had shown a slow but steady increase. During the depression this demand fell off rapidly but began to increase in 1934 and 1935. Since the Agricultural Conservation Program was instituted in 1936 the demand for agstone has grown rapidly until in 1939 a total of 5,459,260 tons was produced, more than double the output of any

By W. E. TRAUFFER

pre-depression year. The 1940 figures are not yet available but are sure to be even higher and present indications are that 1941 production will show a further increase. It is interesting to note that in 1939 less than 10 per cent. of the total output was non-commercial production by the Soil Conservation Service, the W. P. A. and other governmental agencies.

The state of Illinois has always been the leader in the volume of agricultural limestone consumed with Kentucky in second place. The total area of agricultural land in Kentucky, however, is only about 40 per cent. of that in Illinois and Kentucky uses considerably more limestone per acre. There has also been a rapid increase in the use of marl, burned lime and potash in Kentucky since the A.C.P. began buying these materials for farmers and taking the cost out of their conservation allowances. In 1940 the 106 stationary and 205 portable agricultural limestone plants scattered throughout Kentucky supplied 1,284,414 tons of this material to the farmers. In that year 151,811 tons of marl, 8,610 tons of burned lime, and about 300,000 tons of 20-per cent. phosphate were also used. This is in contrast with the 1925 figures of 91,000 tons of agstone, 9,311 tons of marl, and 1,141 tons of burned lime. Most of the production was originally dust incidental to crushing operations but in recent years producers have had to install special pulverizing equipment to keep up with the demand.



The two limestone-pulverizing hammer-mills and their electric vibrating feeders in the plant of the Hopkinsville Stone Company.

One of the four special trucks dumping a skip-load of stone to the pulverizer at the plant of the Cook Stone Company.

Much of the credit for the enviable position the state now holds agriculturally must be given to the Kentucky Experiment Station, the College of Agriculture and the Extension Department which for a quarter of a century have promoted the use of these minerals to the great benefit of the farmers and, incidentally of their producers. Experiment fields, demonstrations, tours and meetings have taught Kentucky farmers the value of these soil builders.

Christian County, of which Hopkinsville is the seat, lies in the southwestern part of the state and leads in the consumption of agricultural limestone. In 1939 farmers in this county used 55,000 tons and in 1940 a record total of 78,001 tons was used, nearly double the consumption of the second county. With native limestone in 100 of the state's 120 counties it is not surprising that many of the counties are self-sufficient in this respect. This is

particularly true in Christian County where most of the agricultural limestone used comes from two plants near Hopkinsville.

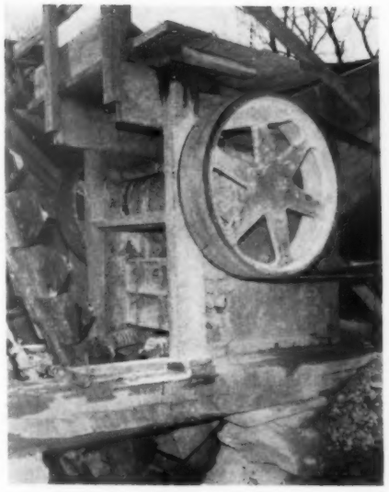
The Hopkinsville Stone Company is one of the leading producers of this material in the state and its operations have been described in these pages several times since its plant was built in 1931. The last article, in the April, 1941 issue of PIT AND QUARRY, described the changes made since that time chiefly to increase the agstone output which is now about 400 tons in an 8-hour day. During the season shipments from this plant often total over 900 tons daily.

In this plant the pulverized-limestone department is entirely independent of the crushed-stone department and either can be operated separately. Crushed stone from two of the six 75-ton bin compartments is fed by Jeffrey-Traylor vibrating feeders to two Jeffrey hammer-mills. Usually ¾-inch stone is fed to the 30- by 36-inch mill and 1½-inch stone to the 36- by 36-inch machine. Elevators feed the products of these mills into bins for loading. The fineness of this material far exceeds the government's requirements of 90 per

The 42- by 36-inch hammer-mill operated by the Cook Stone Company.

cent. through 10 mesh and the Ca CO_3 content averages over 94 per cent. as compared to the 80 per cent. minimum requirement.

The other plant in Christian County is operated by the Cook Stone Company and is located just outside the city limits of Hopkinsville. The quarry was first operated 50 years ago and the present company took over about 20 years ago. Originally only ballast was produced and later crushed stone. The production of mine dust was begun in 1929 when a Bradley pulverizer was installed for this purpose. This machine is operated intermittently as the demand requires and has a capacity of 10 to 15 tons per hour grinding to from 75 to 80 per cent. through 100-mesh. This material is sold in 80-pound paper bags and is sold to nearby coal mines,



The primary jaw crusher operated by D. W. Dickinson.

for sweet feed admixture, etc.

Ballast and other crushed stone remain the principal products of this plant but agricultural limestone is now not far behind. This company had always sold the dust created in its crushing operations to farmers and some years ago installed a hammer-mill with a capacity of 15 tons per hour to augment its production of this material.

Early in 1940 this machine was replaced by a new 42- by 36-inch Jeffrey hammer-mill. This machine is producing from 30 to 40 tons per hour of material with a fineness of 97 per cent. through 10-mesh and with an average calcium carbonate content of 98 per cent. A bucket elevator feeds this material into a truck-loading bin. In slack seasons trucks are used to stockpile this material and a reserve supply of about 20,000 tons is built up. The dust, crushed stone and agstone plants are entirely independent of each other. The capacity of the crushed stone plant is about 75 tons per hour.

For many years quarry cars were used and mules pulled these to the foot of an incline up which they were hauled by a hoist and cable. In March, 1940 the company bought a Brooks 2-cubic yard Load Lugger. This worked out so well that a Load Lugger of 1½ cubic yard capacity was purchased in June, 1940 and another of 2 cubic yard capacity in January, 1941. A fourth Load Lugger of 2 cubic yard capacity was recently added. All are mounted

The hammer-mill in the D. W. Dickinson plant.

on International truck chassis. Together these four machines have 24 buckets. When operating the crushed stone plant three machines are used for it and one for the agstone plant. When the crushed-stone plant is inactive two machines supply the agstone plant. The stone for the agstone plant comes from a ledge of soft rock underlying the hard limestone used for crushed stone.

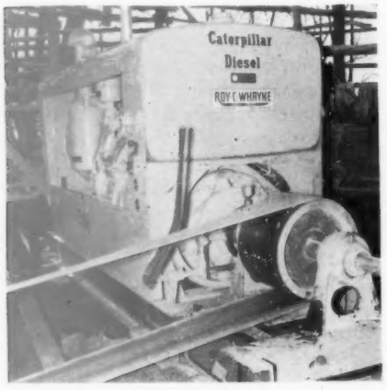
One of the newest and most interesting of the plants in this section is that of D. W. Dickinson which is located near Trenton in Todd County. This county in 1940 used 29,000 tons of agricultural limestone, putting it in fourth place. Mr. Dickinson had formerly been a road contractor and had operated

The pulverized limestone plant operated by D. W. Dickinson near Trenton, Kentucky. The primary crusher is at the right.

Truck discharging skip-load of stone into the primary crusher at the plant operated by D. W. Dickinson.

portable plants to supply materials for this work. This plant, in operation in March, 1940, is his first venture into the agstone field.

The heavy clay overburden on this deposit is removed by a Caterpillar Diesel tractor equipped with a bull-dozer. Stone is loaded by hand into the three 1-cubic yard buckets of a Lambert skip mounted on a Ford truck chassis. The stone is dumped into the Good Roads jaw primary crusher from which it is elevated to a bin. Final reduction of the stone is done by a Gru-



Diesel engine which drives some of the equipment in the Dickinson plant.

endler 3XR hammer-mill and another bucket discharges the finished product into a truck-loading bin. This plant produces about 200 tons of agstone daily in two 6-hour shifts.

The primary crusher and first elevator are driven by a Ford (Ferguson) tractor. A Caterpillar D13,000 Diesel engine drives the pulverizer and the second elevator through flat belts. Air for the jackhammers used in the quarry is supplied by a gasoline-engine-driven Chicago Pneumatic portable compressor.

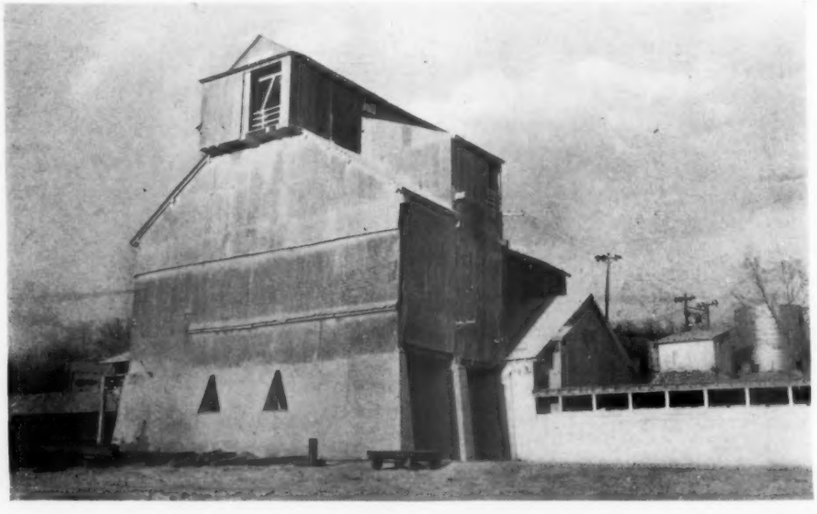
The Cedar Bluff Quarry at Princeton, Kentucky, which has been owned by W. C. Sparks since 1926, is one of the largest crushed-stone operations in Western Kentucky and is also one of the most important producers of agricultural limestone in the state. It is located in Caldwell County which ranked fifth in the state in 1940 with a consumption of 28,000 tons. This is considerably less than the annual output of this plant which is shipped by both rail and truck to this and surrounding counties. Sales of agstone in 1940 were 50 per cent. over 1939 and, along with others in this section Mr. Sparks anticipates even greater demand this year. This product now forms from 40 to 50 per cent. of the total output.

The plant is so laid out that either agstone or crushed stone can be produced exclusively. Its capacity is 150 tons per hour of crushed stone with an incidental 20 to 25 tons of dust of fracture. When producing only agstone the capacity is 50 tons per hour. The agricultural limestone produced is guaranteed to contain over 92 per cent. Ca CO_3. Actually the pulverized limestone, which comes from a soft ledge of rock, averages over 98 per cent. calcium carbonate. The dust of fracture is from a harder ledge of rock and averages over 94 per cent. Ca CO_3.

The quarried stone is loaded into trucks which are hauled up the incline to the plant by a hoist and barney car. A 12N Allis-Chalmers gyratory crusher and a Symons 4-foot cone-crusher are used for primary and secondary crushing, respectively. A 6-inch Allis-Chalmers McCully crusher is used to reduce oversize. A Simplicity screen and three Allis-Chalmers vibrating screens are used. When producing agstone all stone is reduced to minus 1¼-inch size and everything over a ⅛-inch screen goes to a Williams 48-inch hammer-mill which is driven by a 150-horsepower motor.

The 48-inch hammer-mill in the Cedar Bluff plant.

The farmers in Livingston County, which is on the Ohio River northeast of Paducah, Kentucky, are getting most of their agricultural limestone from two different sources. This county is divided east and west by the Cumberland River which also forms part of its eastern boundary. Its southern boundary is the Tennessee River and the Ohio River forms its western and northern boundaries. Because of this unusual



The plant of the Cedar Bluff Quarry at Princeton, Kentucky, which is one of the largest producers of agricultural limestone in the state.

geographical arrangement and the fact that tolls are charged on all bridges and ferries across these rivers the farmers in each half of the county buy their agricultural limestone from producers on their side of the rivers.

Most of the farmers on the south side of the Cumberland River get their agstone from the T.V.A. Kentucky Dam crushed stone plant near Gilbertsville. Many adjoining counties are also supplied from this temporary source. The T.V.A. charges 50 cents per ton at the plant and deliveries can be made in hired trucks.

Most of the agstone for the farmers in that half of the county north of the Cumberland River is supplied from the plant of the Livingston County Co-operative Soil Improvement Association. This is a non-profit organization with headquarters in Smithfield, Kentucky formed for the purpose of providing the farmers with this material at a reasonable cost. Deliveries are made by contract to any part of the county for $1.75 per ton.

Originally the association had the agstone produced under contract but this did not work out satisfactorily. The association took over the existing plant and traded the equipment in on that now being used. The present plant went into operation in March, 1940 and up to December 31st of that year produced 17,000 tons of agricultural limestone.

The hammer-mill in the Livingston County plant.

The plant is located several miles north of Smithfield. Drilling is done with Cleveland jackhammers for which air is supplied by an Ingersoll-Rand compressor. Ford trucks are used to haul the stone a short distance to the plant. Loading has been done by hand but a front-lift shovel mounted on a Caterpillar tractor has been ordered to do this work. The stone is dumped from the trucks into a Gruendler hammer-mill. The product is carried by an elevator to a 2-deck vibrating screen.

The agricultural limestone plant operated by the Livingston County Co-operative Soil Improvement Association.

The dust through the bottom deck goes into a bin as finished product. The two sizes of coarse stone go into two other bin compartments and can be sold for road work. Most of the stone, however, is hauled back to the crusher in trucks.

All shipments are weighed on a Winslow truck scale.

The entire plant is driven by a Caterpillar D13,000 Diesel engine. The crusher is driven through a flat belt. The elevator is driven by belt and chain from the crusher and the screen is belt driven from the head shaft of the elevator.

Shipments of Bentonite Make All-Time Record

Topping by a wide margin their 1939 all-time record, sales of bentonite rose in 1940 to a new peak of 247,132 short tons valued at $1,879,551, according to reports of producers to the Bureau of Mines. The 1939 output was 219.720 tons, worth $1,702,393 and the previous record was 194,768 tons valued at $1,500.758 in 1937. Although bentonite clay was used by pioneers in the Western country to grease the wheels of their covered wagons and instead of soap, this mineral is a relatively new commercial product. As recently as 1925 the total output was less than 5,000 tons.

Bentonite is important to the defense effort principally because of its use in foundry molding and core sands.

Cavalcade (from page 41)

ton, 2-compartment truck-loading bin. Two sizes of stone are stored in this bin and a third is carried on a 24-inch by 10-foot conveyor to a 25-ton bin. The screen is driven by a 10-horsepower motor and the conveyor by a 3-horsepower motor. This equipment is hauled on special bed trailers. The large bin has a hand winch at each corner for raising it into position.

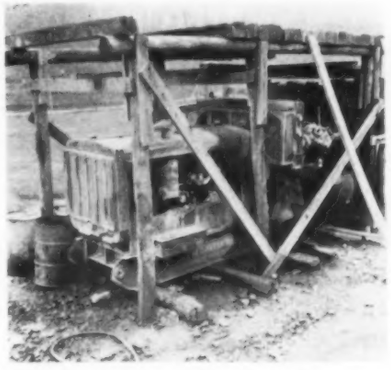
The generating plant which supplies power for all of this equipment is mounted on a separate trailer. Two Murphy 160-horsepower ME 650 Diesel engines drive 125-kilowatt Ideal self-regulating generators. Ordinarily both generating sets are used but when producing coarse stone one set is sufficient. That power is being generated at very low cost is evident from the figures for a typical day. On March 15 a total of 1920 tons of 2½-inch minus stone was produced in a 9½-hour day with a fuel oil consumption of only 125 gallons. Heavy armored electric cables are used to distribute the power to the motors.

Ideal Electric Company Noel One-Unity power factor electric motors are used exclusively. Each motor has a capacitator with a reserve of energy which protects the generators from shock loads and improves the power factor.

E. P. Aleridge is superintendent of this plant. Fred Fiala, whose last appearance in these pages was in connection with the production of aggregates for the Pennsylvania Turnpike, is manager of all operations for the Contractors' Service Corporation.

Ralph Rogers (from page 39)

scribed above. The material through both decks of this screen dropped into the 150-ton truck-loading bin. Deliveries were made in hired trucks, as many as 60 being used at one time.



One of the two Diesel-engine-driven air compressors at the quarry.

Power for all operations was supplied by Diesel engines. A Caterpillar D 13,000 engine drove the primary crusher and its feeder and another drove the cone reduction crusher. The jaw reduction crusher was driven by a 60-horsepower Caterpillar Diesel engine. The conveyors and screens were driven by individual electric motors for which current was produced by a Caterpillar D 13,000 generator set. Compressed air was supplied by Ingersoll-Rand and Sullivan air compressors driven by Caterpillar Diesel engines. When operating at capacity these five Diesel engines and the shovel engine used 800 gallons of fuel oil in 24 hours.

PERSONAL MENTION

B. D. KEATTS, housing consultant of the Portland Cement Association since 1938 and member of the executive committee of the 1941 Milwaukee Home Show committee, has resigned to become an engineer for the Dur-Ite Corporation, Chicago. Mr. Keatts has been active in the promotion of concrete-masonry construction in the housing field in Wisconsin which resulted in 216 new dwellings of that type in 1940.

GEOFF SAEGER, who has been at the plant of the Gulf Portland Cement Company, Houston, since it was built has been transferred to the Fort Collins, Colorado plant of the Ideal Cement Company. Ideal took over the Gulf plant recently.

D. B. WILLIAMS has been elected president of the Cooper-Bessemer Corporation of Mt. Vernon, Ohio succeeding the late CHARLES B. JAHNKE, who died May 6 following a heart attack.

D. G. REINIG has sold his stone quarry at Snoqualmie, Washington, to the King County Commissioners.

J. F. ULRICH has been adding to the equipment of his sand and gravel business at Salem, Oregon.

ROBERT T. BOWMAN has been appointed director of public relations for the John A. Roebling's Sons Company, with plants at Trenton and Roebling, New Jersey. He served three years as president of the New Jersey State Chamber of Commerce and retired from that position only recently.

HARLOWE HARDINGE, president and general manager of the Hardinge Company, Inc., has just returned from a trip to Mexico City and vicinity. He reports that conditions are still rather dormant but he believes that there is a definite feeling that they will improve with time.

B. W. CRENSHAW, general superintendent of the Sampsel, Missouri plant of the Cooley Gravel Company for the last four years, has resigned to become works engineer for the Scully Steel Company of St. Louis.

HENRY J. CARPENTER, 52, vice-president of the Pine Creek Lime & Stone Company, Jersey Shore, Pennsylvania passed away recently. He had been in ill health for many months.

S. D. NANCE, sales manager of the basic slag division of the Tennessee Coal, Iron & Railroad Company, died April 15 at the company's Fairfield, Alabama hospital after a brief illness. He had been with the company since 1911.

R. R. SANDERSON, 63, president and general manager of the Sanderson-Cyclone Drill Company, Orrville, Ohio, died April 24 after an illness of more than five years. Mr. Sanderson became the active head of the company in 1915, and since that time has figured prominently as a manufacturer and designer of all types of drilling machinery.

CYRUS A. BARRETT, 66, secretary-treasurer of the Keystone Gravel & Sand Company, Indianapolis, died recently at his home after a brief illness.

WILLIAM T. RANDALL, Philadelphia sales engineer of the Pangborn Corporation, Hagerstown, Maryland, died suddenly of a heart attack recently.

FRANK VAN ETTEN, vice-president of H. D. Conkey & Company, Mendota, Illinois, passed away recently. He was in charge of the sand-aid-gravel producing activities of the firm.

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Here's a sure way to make substantial cost reductions on your hauling. Truck users in more than a score of industries report savings as high as 40% on investment, 30% on operating costs and 35% on upkeep expense.

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Manufacturers also of the THORNTON automatic-locking DIFFERENTIAL
"When you need TRACTION you need THORNTON"

ALFRED H. CROPP, superintendent for many years of the Power City Stone Company, St. Davids, Ontario, died recently.

WILLIAM A. MCNEILL, for a number of years manager of the Horse Shoe Quarries at St. Marys, Ontario, died recently in Toronto.

GEORGE H. DENT has been named district engineer of the Asphalt Institute with offices in the Transportation Building, Washington, D. C.

FOREIGN PRACTICE

Particle Determination

F. Gille reports from the research institute of the Association of German Iron Portland Cement Works. Since publication, in 1930, of Andreasen's method for determination of particle size, several suggestions have been made to use other dispersion agents than the one used by him: ethylene glycol with various peptisators. For example, American researchers have indicated petroleum with oleic acid as peptisator. Haegerman, in 1933, substituted in place of the viscous glycol the more liquid ethanol, adding fused calcium chloride at the rate of about 3 gram per liter as a peptisator. But the preparation, and also the use of this dispersion agent is complicated.

F. Gille has found a series of liquids which are at least equal in value to Haegerman's alcohol solution, but are much easier to handle and require no peptisator. As compared to petroleum and oleic acid, they have, besides a better dispersion ability, the advantage of being uniform chemical substances with known viscosity and density. The liquids are all weak organic bases, and namely pyridine bases and aromatic amines. Pyridine, quinoline, aniline, diethylaniline and orthotoluidine were found in the test tube to be suitable. In clinker-fat mixtures, pyridine is superior to the alcohol solution; and in mixtures with much basic slag sand the orthotoluidine is the best dispersion agent of those investigated.

Viscosity and density of these dispersion agents at various stages of test procedure are given. Also given are the periods of sedimentation for different particle sizes: of a clinker, of a fine clinker containing 4% gypsum, of a high strength iron portland cement with $CaCl_2$ addition, of an alumina cement, and of a basic foundry slag cement—using the four dispersion agents. Safety rules are given for proper handling of these chemicals.—*Tonindustrie-Zeitung*, vol. 65 (1941), no. 11, pp. 101-102.

Aggregates Preparation

Dr. Eng. G. Gerth and engineer A. Baumgarten of the German Research Institute for Rock and Earth describe requirements for the preparation of aggregates for concrete.

Natural aggregates consist of gravel and sand, diatomaceous earth (Kieselgur), crushed products of hard and soft rock. Artificial aggregates consist of blast furnace slag, crushed products of brick, boiler slag, copper and lead slag, crushed products of syntholite (calcium-silicate fusion).

Sands and gravels, usable, include river sands and gravels, diluvial pit sands and gravels, and also pumice sands and gravels, and diatomaceous earth is suitable also.

Hard rocks include chiefly granite, syenite, diorite, gabbro, quartzophyre, porphyrite, diabase, phonolite, basalt, gneiss, granulite, amphibolite, and also quartzite.

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Compact, lighter in weight, the Murphy is a true DIESEL, providing real operating economy with simple, sturdy construction that means years of reliable performance. Generator Sets are rugged, compact, simple to operate — in every detail built for continuous heavy duty service.

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Feed size—3/8".
Moisture in feed—6%.
Product—99% passing 200 mesh.
Moisture in product—.25%.
Capacity—1.6 tons per hour.

Limestone

Feed size—2".

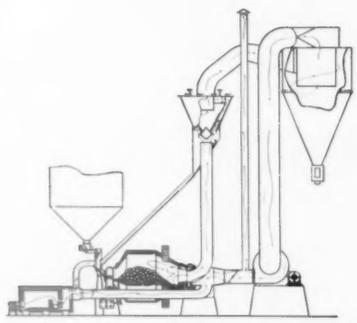
Moisture in feed—7%.
Product 91%—200 mesh.
Moisture in product—.6%.
Capacity—21 tons per hour.

Coal

Feed size—1".

Moisture in feed—15%.
Product 78%—200 mesh.
Moisture in product—1%.
Capacity—15 tons per hour.

A very satisfactory method of grinding damp hard materials to any degree of fineness wanted.



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Soft rocks include chiefly limestone, dolomite and sandstone.

Pumice sand and gravel, and crushed brick products are used only in making light concrete; and all other aggregates are used for making heavy concrete.

Unsuitable are weathered rocks and basalts with appearance of sunburn, and also rocks with iron pyrites as an accessory constituent.

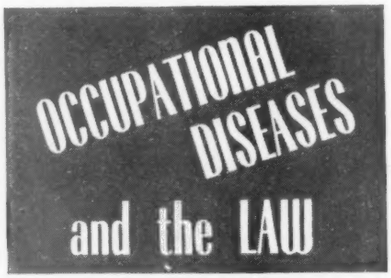
Crushed-brick products should be made of hard and but slightly porous brick (hard-burned brick, clinker). But burned porous loam is recommended as flux material in the Nordic countries (Scandinavia) due to their poverty in natural aggregates; this flux or aggregate material is made by burning suitable loam and is designated as "clinker."

Among slags, which are used as aggregates in pieces and in sand form, boiler slag can not be used directly, but must first be prepared since in order to avoid damage in concrete, certain constituents such as sulphate, sulphite, sulphur, burned lime, unburned coal must first be removed.

Most of the aggregate materials must be screened into definite classes of particles. The maximum particle size depends on the kind of concrete to be made and in general is 80 mm. for mass or bulk concrete, 30 mm. for reinforced concrete, 7 mm. for coarse mortar, and 2 mm. for fine mortar.

Substances detrimental to concrete should be eliminated, or tolerated only to definite limits, including those which reduce the strength and weather stability of concrete, attack iron used in concrete, and retard the concrete set. Such detrimental admixtures are loam and clay, humus-like substances such as wood, coal, humic acid and also inorganic impurities such as chlorides, sulphides, sulphates and acids. Loam and clay are detrimental not only because of their extremely fine particle distribution, but also because they influence the chemical hardening process unfavorably. For that reason it is not possible to use weathered rock and so-called "sunburners" as aggregates, whose conversion products are mostly of a colloidal nature.

Particle shape and surface characteristics of aggregates have an important influence upon quality of concrete. Round particles are easily mixed and require less mixing mortar than angular aggregates of particularly plate-like forms. The compressive strength of concrete is not dependent upon the roughness of the aggregate particle; but the tensile and flexural strengths are increased essentially by using a rough particle as compared to a smooth particle. The strength qualities of the aggregates themselves must be considered also, for they must be greater than those of the cement, since the strength qualities of the concrete drop considerably if the strengths of the aggregate material are lower than those of the cement. Furthermore, the resistance to wear of the concrete is influenced essentially by the strength qualities of the aggregate materials, which should be considered especially in the selection of aggregates for finish concrete; and the rock must be at the same time tough and resistant to weather.—*Steinindustrie und Strassenbau,* vol. 36 (1941), no. 3, pp. 41-47.



Poisoning

Loucks v. Diamond Chain & Manufacturing Company, decided by the Supreme Court of Indiana, March 10, 1941; reported at 32 N.E. (2d) 308.

This was an appeal from a proceeding before the Indiana Workmen's Occupational Diseases Act (Acts 1937, Chapter 69; Burns' Indiana Statutes, 1933, Sections 40-2201 *et seq.,* Baldwin's Supplement, 1937, Sections 16499 *et seq.*) in which the claimant sought compensation for disability allegedly due to the inhaling of carbon monoxide in his occupation as a tool hardener. The Industrial Board found that the disability was neither directly nor indirectly due to any occupational disease, and denied compensation. The Supreme Court, however, held that "the circumstances of being exposed to the poisonous gas, and being in a physical condition generally attributed by medical science to poisoning from that gas, and the absence of and inability of the doctors to discover any other possible cause for his condition, seem sufficient to establish that he was the victim of an occupational poisoning." The judgment was reversed and the case remanded to the Industrial Board.

Bursitis

Kalee v. Dewey Products Company et al., decided by the Supreme Court of Michigan, March 11, 1941; reported at 296 N.W. 826.

This is an appeal from an award of compensation to an employee found to be disabled from bursitis resulting from the use of her arm in operating a bottle-filling and labeling machine. The

employer contended that bursitis which results from overuse of the shoulder by one employed in preparing medicines and drugs is not characteristic of and peculiar to that particular employment, and therefore is not compensable. The court holds, however, that that contention places too narrow an interpretation on the term "occupational disease," since the statute (Act No. 61, Michigan Public Acts of 1937, Part VII, Section 1(c), Statutes Annotated, Section 17.220, 1940 Cumulative Supplement) defines an occupational disease as one which is due to causes and conditions which are characteristic of and peculiar to a particular "process," as well as those peculiar to a given trade, occupation or employment. It was also claimed that bursitis is only compensable if it results from rubbing or pressure applied externally by the process itself, and not if it arises from an internal rubbing and pressure of the bones and bursa sac. The court holds, however, that the statute (Act No. 61, Michigan Public Acts of 1937, Part VII, Section 2, Item 26, Statutes Annotated, Section 17.221, 1940 Cumulative Supplement) neither expressly nor impliedly limits compensation for bursitis to cases where it is caused by pressure or rubbing applied externally. The award is affirmed.

Silicosis

Morrison et al. v. Industrial Accident Commission et al., decided by the California District Court of Appeal, Third District, January 29, 1941; reported at 109 Pac. (2d) 767.

The petitioner in this suit is the widow of a miner whose death was due to silicosis ("miner's consumption"), according to the first findings made by the Industrial Accident Commission and by the court in an earlier appeal (*Morrison v. Industrial Accident Commission,* 29 Cal. App. (2d) 528-532, 85 Pac. (2d) 186). The widow contended that silicosis, contracted while working in the mine, led the development of tuberculosis, from which, admittedly, death ensued. The respondents contended that silicosis was not the sole cause of death, and that the sole cause of death was tuberculosis, which did not arise from employment in the mine. In the first appeal the court held that the finding of the commission, to the effect that Morrison died from an occupational disease which was incurred in the course of his employment, should be upheld. Subsequently, however, the commission made a second decision denying compensation. The court in this appeal holds that the additional evidence is "merely cumulative" and not substantially different, and that compensation should be awarded because the earlier decision controls. The commission, accordingly, is ordered to make a further award for the payment of the compensation provided by law.

TRAFFIC News Digest

Central Association

Docket 66742.—(Shipper's Proposal)—Limestone, agricultural, unburnt (not ground or pulverized), in open-top cars, carload. Establish rate of $1.49 per net ton for Martin, Ohio to Beliot, Garfield and Moultrie, Ohio, *via* N. Y. C. (W), Cleveland, Ohio, P. R. R.

Docket 66738.—(Shipper's Proposal)—Crude limestone, in open-top cars, carload, minimum weight 90 per cent. of the marked capacity of the car, except when car is loaded to full cubical or visible capacity, actual weight will apply. Establish rate of 77 cents per net ton from Lewisburg, Ohio, to Osborne, Ohio, via N. Y. C. (C) direct.

Docket 66739.—(Shipper's Proposal) Stone, fluxing, furnace or foundry, melting or refactory (unburned) in bulk, in open-top cars, carload, minimum weight per car 90 per cent. of the marked capacity of the car furnished, except when car is loaded to full cubical or visible capacity, actual weight will apply. Establish rate of $1.44 per gross ton from Lewisburg, Ohio, to Youngstown, Ohio.

Docket 66748.—(Carrier's Proposal)—Sand and gravel, regardless of description. Cancel all rates, ex-lake or otherwise, on, from Toledo, Ohio, to destinations in C. F. A. territory, except to points in the state of Ohio. Classification rates to apply.

Docket 66779.—(Carrier's Proposal)—Sand (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, moulding or silica) and gravel, in open-top cars, carload, minimum weight 90 per cent. of the marked capacity of the car, except when car is loaded to full visible or cubical capacity, actual weight will apply. Establish rate of 61 cents per net ton from Wolcottville, Indiana, to South Whitley, Indiana, via P. R. R. direct. To expire December 20, 1941.

Docket 66867.—(Carrier's Proposal)—Crushed stone, in bulk, in open-top cars; sand (except blast, core, engine,

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SAVE ROPE. When ordinary U-Bolt Clips are removed, bent and crimped rope must be cut off — wasting rope. When Laughlin Safety Clips are removed, rope is straight and strong, ready for use again — no waste of rope.

FEWER CLIPS NEEDED. Here's another big saving. You use only three Laughlin Safety Clips to get the same strength you get with four ordinary U-Bolt Clips.

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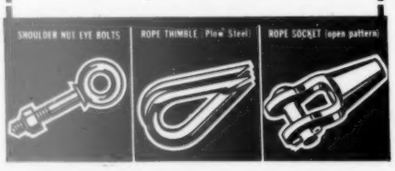

filter, fire, or furnace, foundry, glass, grinding or polishing, loam, moulding or silica) and gravel in open-top cars, carload. Establish on, from Greencastle, Indiana, to Knightsville, Indiana, on crushed stone and to Reelsville, Indiana, on sand and gravel, 30 cents, *via* P. R. R.

Motor Proposed Reports

Mt. Pleasant, Utah.—MC 96224, Leslie Shelley, contract carrier application. Joint board 29. Permit proposed, on further proceedings. Lime rock, in bulk, from Fox Creek Quarry, Wyoming, over an unnumbered highway to Fox Creek Siding, Idaho, (a point located on the Union Pacific Railroad line, approximately five miles south of Driggs, Idaho). In the season extending from May 1 to October 30 of each year. Modified procedure.

Fourth Section Applications

Docket 19010.—Filed by W. S. Curlett and I. N. Doe requesting fourth section relief to establish rates on granite, in less carloads, from points in Vermont to points in New England and trunk line territories circuitous routes and to apply over short tariff routes. Rates constructed on the basis of the short line distance formula being grounds for relief.

Docket 19027.—Filed by the L. & N. requesting fourth section relief to establish rates on cement, cement mix, and masonry cement, carloads, from Birmingham, North Birmingham, Boyles and Phoenixville, Alabama, to Atwood and Wolf Creek, Tenn., being the grounds for relief. Schedules filed containing the proposed rates are F. D. Miller I.C.C. 572 Supplement 19.

Docket 19028.—Filed by B. T. Jones requesting fourth section relief to establish rates on sand, except ground or pulverized, carloads, from Ottawa, Illinois, to Montreal, Quebec, to meet water competition. Schedules filed containing proposed rates are B. T. Jones I.C.C. 2480 Supplement 17.

Uniform Bills-of-Lading

The National Industrial Traffic League, with a view to bringing about the use of identical or uniform bills-of-lading by rail and motor common carriers, has asked the Commission to reopen for further hearing Number 4844, the proceeding in which it prescribed forms for the straight and order-notify bills-of-lading for use by the railroads. Because of the different character of the liability of carriers by water, the League's petition does not cover bills-of-lading forms for them.

Motor carriers which are members of the American Trucking Associations, Inc., according to the petition, use the railroad form of bills, the forms being part of National Motor Freight Classification No. 9, MF I.C.C. 9, which became effective December 31, 1940. The League's petition points out that the Commission has not prescribed any forms for the motor carriers. According to the League's petition, the League has had informal and cooperative conferences on the subject with representatives of the railroads and motor carriers with a view to obtaining uniform or common forms. The petition states final agreement for general adoption has been impeded or prevented by the objection of certain carriers.

In addition to reopening the old proceeding the League asks the Commission to enlarge the inquiry or investigation by making all common carriers which are subject to parts 1 and 2 respondents thereto so as to make the inquiry into the terms, forms and conditions in the bills-of-lading used and to be used by all common carriers subject to the two parts, and in instances where there is joint transportation with carriers by water.

LABOR DECISIONS

Waiver

Fleming v. Warshawsky & Company et al., decided by the U. S. District Court, Northern District of Illinois, Eastern Division, November 22, 1940; reported at 36 Fed. Supp. 138.

This was a proceeding charging contempt of court in the alleged failure of the respondent company to comply with a judgment enjoining certain violations of the Fair Labor Standards Act of 1938 and ordering performance of certain acts (by reference to a stipulation and schedule), including payment of unpaid minimum wages and overtime compensation to certain employees. The court rules that the judgment requiring such payments is void or unenforceable for want of certainty; but, if it is valid, it should be enforced by execution rather than by a contempt proceeding. Three employees were paid the amounts claimed, but twelve employees waived their claims against the company. The court holds that the employees in whose favor the award was made were the beneficiaries of a money award and had the legal right in the absence of coercion or fraud on the part of the employer to decline the benefits of the award, and that the employer had the legal right, in the absence of coercion or fraud, to accept the waiver by its employees. The contempt proceedings are dismissed.

Certification

A. G. M. Workers' Association v. National Labor Relations Board, decided by the U. S. Circuit Court of Appeals, Seventh Circuit, December 20, 1940; reported at 117 Fed. (2d) 209.

Here a labor organization sought to have set aside an order of the National Labor Relations Board dismissing its petition for certification as exclusive collective-bargaining representative of employees at a certain plant. The court holds, however, that it has no jurisdiction, and that the organization has no redress by appeal from the board's decision. Arguments that the failure to provide court review of such a decision creates hardships must "be addressed to Congress and not to the courts."

Jurisdiction

Berger v. Clouser et al., decided by the U. S. District Court, Middle District of Pennsylvania, December 31, 1940; reported at 36 Fed. Supp. 168.

The defendants in this action, which is a suit seeking to recover unpaid overtime compensation and a like amount as liquidated damages under the Fair Labor Standards Act of 1938, contended that the act is unconstitutional, and that the federal court does not have jurisdiction. The court holds that all the claims of unconstitutionality have been decided in favor of the act in various cases previously decided. The Judicial Code (Section 24(8)), says the court, gives the federal court jurisdiction regardless of diversity of citizenship between the parties, and regardless of the amount involved. To the contention that the subject matter pertains only to local contracts for labor between citizens of the same state, the court answers that the plaintiff's pleadings show that the defendants are engaged in the production of goods for interstate commerce, specifically within the scope of the act. The motion to dismiss the compaint on these grounds is refused.

No Demand

Lewis et al. v. Nailling et al., decided by the U. S. District Court, Western District of Tennessee, Eastern Division, October 5, 1940; reported at 36 Fed. Supp. 187.

This was a suit under the Fair Labor Standards Act of 1938, in which the plaintiff employee was awarded judgment for unpaid minimum wages, a like amount as liquidated damages, and attorney's fee. Among the defenses the defendants urged that the award should not be made because the plaintiff failed to make any demand for unpaid wages or overtime compensation before instituting the suit and because he anticipated bringing action while he was still in the defendant's employ, even to the point of gathering evidence for the purpose. These circumstances, says the court, are deemed immaterial. No provision of the Fair Labor Standards Act, either in terms or by necessary implication, bars plaintiff's action on account of such conduct.

Stock Plan

National Labor Relations Board v. Vincennes Steel Corporation, decided by the U. S. Circuit Court of Appeals, Seventh Circuit, January 3, 1941; reported at 117 Fed. (2d) 169.

While efforts were being made to organize the respondent company's employees into a union, the company instituted a stock-purchase plan whereby each subscriber employee received ten shares of stock of a par value of $100 and gave the company his note for $1,000. The note was to be paid by the application of stock dividends and any bonuses which the company might declare. A provision of the plan required the subscribing employee to work at the same hourly wage he was then receiving.

The National Labor Relations Board decided that the stock-purchase plan was promulgated as a device to circumvent the union and that, as a result thereof, the company had interfered with, restrained and coerced its employees in violation of the National Labor Relations Act. The court holds that in view of evidence of the company's hostility to the union, the board's decision must be sustained. It carefully points out that its conclusion is based upon the facts of the particular case "and not upon any public policy which *ipso facto* condemns such a plan." Such a plan "might be beneficial both to the employer and the employee, especially the latter entered into in the utmost good faith, and without interference with, or restraint upon, the rights of the employee as guaranteed by the act. The plan under consideration, however, which binds the employees to refrain from requesting a rise in wages is, on its face, invalid. It deprives the employee of the right to designate an agent to bargain with reference thereto."

Foremen

Solvay Process Company v. National Labor Relations Board, decided by the U. S. Circuit Court of Appeals, Fifth Circuit, January 4, 1941; reported at 117 Fed. (2d) 83.

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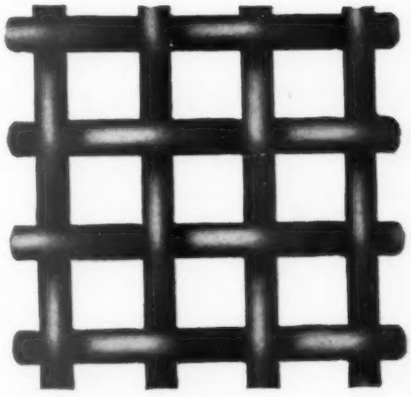

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An order of the National Labor Relations Board directing the petitioning company to cease interference, etc., with the self-organization of its employees, to withdraw recognition from an Employees Council and to bargain with a union, etc., is held to be supported by the evidence. Although the consistent policy of the company was to comply with the National Labor Relations Act, the evidence shows that employees were coerced and intimidated by two foremen, and "although the actions of the foremen were contrary to the orders of the company manager and to the express policy of the company, there is no doubt that they constituted unfair labor practices by the employer." The inference of unwarranted refusal to bargain with the union claiming to represent a majority of the employees was fairly drawn from evidence of "the steadfast unwillingness of the manager to negotiate" with the committee, and "his continuing failure to consent to an impartial determination of the propriety of their requests for recognition, when viewed in the light of his active disparagement of union organizations."

Discharges

National Labor Relations Board v. Southport Petroleum Company, decided by the U. S. Circuit Court of Appeals, Fifth Circuit, January 4, 1941, rehearing denied February 1, 1941; reported at 117 Fed. (2d) 90.

After three officers of a union which was active in organizing the employees of the respondent company were discharged, the members of the union stopped working openly for it, membership lagged, attendance at the meetings dropped sharply, and the forward progress of the union was stopped. The court concludes that it was a fair and reasonable inference that the officers were discharged because of their union activities, and an order of the National Labor Relations Board directing the company to cease certain unfair labor practices and to offer reinstatement with back pay to the union officers is affirmed. The corporation was dissolved after the entry of the order, but under Texas law that does not prevent the affirmance of the order.

Espionage

Atlas Underwear Company v. National Relations Board, decided by the U. S. Circuit Court of Appeals, Sixth Circuit, January 15, 1941; reported at 116 Fed. (2d) 1020.

An order of the National Labor Relations Board requiring the petitioning company to withdraw recognition from an inside union and to discontinue espionage or surveillance, interference, restraint or coercion of its employees in the exercise of their rights to self-organization is affirmed on a review of the evidence. Among the showings of hostility to an outside union and favoring of the inside union was a statement to employees that it might be necessary to close the plant. which, "made during a period when unionization of its employees was sought to be effected, must be regarded as coercive, notwithstanding sincere belief on the part of the petitioner's executives that such result would of necessity follow."

On the question of espionage the court says that "given employer hostility to unionization, employment of a private detective agency and the installation of an operative in the guise of a production worker, the billing of union dues by the agency as expense, reports to management immediately destroyed, and the presence of the investigator at union meetings, all taken together not only sustain but compel the inference that the primary purpose of the employment of the private agency was espionage over and surveillance of union activities."

Reduction of Wage

Remer v. Czaja, decided by the U. S. District Court, District of Maryland, January 25, 1941; reported at 36 Fed. Supp. 629.

When the Fair Labor Standards Act of 1938 went into effect the plaintiff's employer increased the wages of some employees in order to meet the minimum requirements, and, in order to do that, reduced the plaintiff's wages. There was no reduction of the plaintiff's wages below the minimum requirements of the act, nor have its overtime provisions been violated. The plaintiff sued to recover the amount represented by his wage reduction from the effective date of the act until his employment ceased, plus an equal amount as liquidated damages under the act, and an attorney's fee. His claim was based on the last sentence of Section 18 of the act: "No provision of this chapter shall justify any employer in reducing a wage paid by him which is in excess of the applicable minimum wage under this chapter . . ."

The court holds, however, that the plaintiff cannot recover, because the act provides no relief for violations of Section 18. "We have no hesitancy in concluding that since Congress failed to include violations of Section 18 among the prohibitions of Section 15 (a) or to provide any civil or criminal liability under Section 16 with respect to

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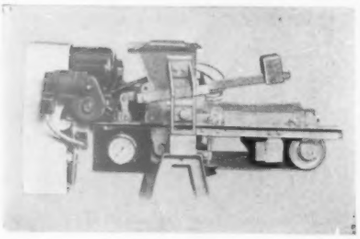

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Section 18, this section is not to be construed as limiting the reduction of wages so long as the reduction is not below the minimum prescribed by the act . . . Plaintiff might have redress only if the defendant had contracted to employ him on the alleged basis, and even then his right of action would not be under the act, but at common law for breach of contract—an ordinary suit for damages. In such a case if the contract were otherwise binding, the employer could not set up the defense of the Fair Labor Standards Act."

Election

Great Atlantic & Pacific Tea Company v. Boland et al., decided by the New York Supreme Court, Special Term, New York County, January 28, 1941; reported at 25 N.Y.S. (2d) 517.

In this case an employer sought a declaratory judgment and temporary injunction to restrain the New York State Labor Relations Board from holding certain elections among the plaintiff's employees in order to determine the proper representatives for collective bargaining. The court denies the injunction on the ground that the declaratory judgment could be rendered only where the constitutionality or applicability of the statute is in question, and most of the plaintiff's objections do not involve those questions. A claim that the board exceeded its jurisdiction in attempting to investigate a controversy between members of the same parent labor union (in violation of subdivision 3 of Section 705 of the State Labor Relations Act) does not affect the result, because (1) the controversy was settled by stipulation and (2) the employer is not affected by that controversy.

Closed-Shop Contract

Ralston et al. v. Cunningham et al., decided by the Superior Court of Pennsylvania, January 30, 1941; reported at 18 Atl. (2) 108.

The plaintiffs are workers who seek an injunction restraining their employer from discharging them and from requiring them to pay dues to a union with which the employer has a closed-shop contract. The court holds that this case does not involve or grow out of a "labor dispute" but "is rather a quarrel over the interpretation of the document which settled a labor dispute"; that the court has jurisdiction to interpret the contract as a legal document, and that there is no warrant for holding that the legal construction of the contract should be assigned to an administrative board or to arbitration; and that the plaintiffs could have kept their jobs if they had paid dues, and can get them back by doing so. The workers must be members of the contracting union, but they may remain also in a rival union if they wish. The refusal of the trial court to grant the desired injunction is affirmed.

State Court

Tapp v. Price-Bass Company, decided by the Supreme Court of Tennessee, February 1, 1941; reported at 147 S.W. (2d) 107.

This is a suit under Section 16 (b) of the Fair Labor Standards Act of 1938 to recover unpaid minimum wages, overtime compensation, an equal amount as liquidated damages and attorney's fees. The defendant demurred to the bill on the ground that the suit is one to recover a penalty and that the federal courts have exclusive jurisdiction. The court holds that the trial court was correct in overruling the demurrer. "It is a reasonable inference that Congress intended to afford under Section 16 (b) speedy, convenient and inexpensive relief to employees seeking to enforce its provisions. . . . To construe the words 'any court of competent jurisdiction' to refer to federal courts only, because of the presence of the words 'as liquidated damages,' would, in our opinion, violate the spirit and intention of the act and effectuate a result in many instances of hardship and inconvenience to the very persons made the beneficiaries of the act."

The court points out that the same conclusion was reached by the supreme courts of Alabama (*Forsyth v. Central Foundry Company,* 198 So. 706) and North Carolina (*Hart v. Gregory,* 218 N.C. 184, 10 S.E. (2d) 644, 130 A.L.R. 265), both of which sustained the jurisdiction of the local courts, but that the Court of Appeals of Georgia held to the contrary (*Anderson v. Meacham,* 62 Ga. App. 145, 8 S.E. (2d) 459, certiorari denied by the Supreme Court of Georgia, May 21, 1940).

Union

National Labor Relations Board v. Acme Air Appliance Company, Inc., decided by the U. S. Circuit Court of Appeals, Second Circuit, February 3, 1941; reported at 117 Fed. (2d) 417.

An order of the National Labor Relations Board requiring the employer involved to cease and desist from refusing to bargain collectively with a union as representative of all its employees is held to be supported by evidence showing that although the company had dealings with the union, it insisted that any agreement it might reach would be between the company and its employees, and not between the company and the union. The act "requires more

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THAT spiral lap welded seam reinforces each length of Taylor Spiral Pipe from end to end—gives it strength beyond that of any pipe of its weight. In Taylor Pipe the pitch of the spiral is carefully selected for each group of sizes to give the proper structural strength for the given pipe diameter, as shown above.
This stronger but lighter pipe can cut your costs. There is a type of joint—a type of protective coating—a size and gauge —for every service where a light walled pipe is used.
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than that the chosen bargaining representative should be recognized as a messenger." Since the employees' union cards were for a term of one year, which has elapsed, the court remands the case to the board "to determine who, if anyone, is at present the lawful bargaining agent" of the employees and to make such order as may be appropriate. An order for reinstatement of certain employees, with back pay is affirmed.

The Ransome Concrete Machinery Company, Dunellen, New Jersey, announces the appointment of Kern-Limmerick, Inc., 115 North Spring Street, Little Rock, Arkansas,

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Overall Distributed Vibration

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Write for Bulletin No. 14H

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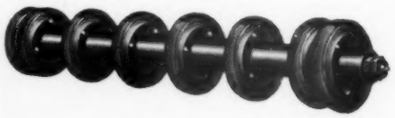
The Original Deister Co.
Established 1906
911 Glasgow Ave., Ft. Wayne, Ind.

NEW MACHINERY and SUPPLIES

• Rubber-Tread Idler

The development and manufacture of a new line of rubber-tread idlers for supporting the return run of 14- to 60-inch wide belt-conveyors is announced by the Link-Belt Company, Indianapolis.

Each complete idler consists of from four to twelve 6-inch diameter rubber-tired rolls suitably spaced and mounted on a "friction-fighter" roller-bearing-equipped steel tube that will fit into the same supporting hangers as the regular Link-Belt return-idler roll.



Rubber-tread return idler for belt-conveyors.

The individual rolls consist of a renewable extruded rubber tire clamped between two steel disks firmly held together by three round-head bolts. As the rubber tire is made in split form, it can readily be replaced with a new tire when required by just removing three nuts instead of having to strip the entire unit and other rolls off the tube, which would be necessary if the rolls had tires that were made endless.

The new idlers are especially recommended for conveyors handling corrosive, abrasive, wet, or sticky materials, such as salt, phosphate rock, fertilizers, wet coal, etc., because (1) there is only a rubber-to-rubber contact between return idler and the underside of conveyor belt, and (2) as the kneading action of the rubber treads keeps the material from building up, also helping to break up and loosen ice forming on the belt in freezing weather.

• Compressor

The Schramm Model 105 Fordair power take-off is a compact compressor designed for driving from the engine of a truck. Complete with built-in cooling system the unit takes up less than half the space of the ordinary power take-off compressors. The compressor, a converted Ford V-8 engine, delivers 105 cubic feet of air at 100 pounds.

With the tank mounted overhead the entire installation is quickly and economically made.

With most of the parts available at every Ford dealer service is easy to obtain and the cost of up-keep is said to be practically nothing.

The unit is designed for truck engines with 221 cubic inches or larger. The engines are governed to operate at 1400 to 1600 r.p.m. normally. When operating as a truck the governor can be thrown out of operation.

Compressor mounted on a truck with power take-off from the truck's engine.

The 8-cylinder construction gives a small peak torque and thus the life of the power take-off is prolonged.

• Scraper

Designed to give increased yardage with D8 tractor power, R. G. LeTourneau, Inc., has introduced the Model FU Carryall cable-controlled scraper, a patented double-bucket model with a struck capacity of 17.7 and a heaped capacity of 23 cubic yards.

Because of this patented double-bucket design, loading is made easier and capacity increased, giving the effect of loading two small Carryalls one after the other. The rear bucket telescopes forward and is loaded separately. After the first bucket is loaded to capacity, it

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100 Tons per Hour

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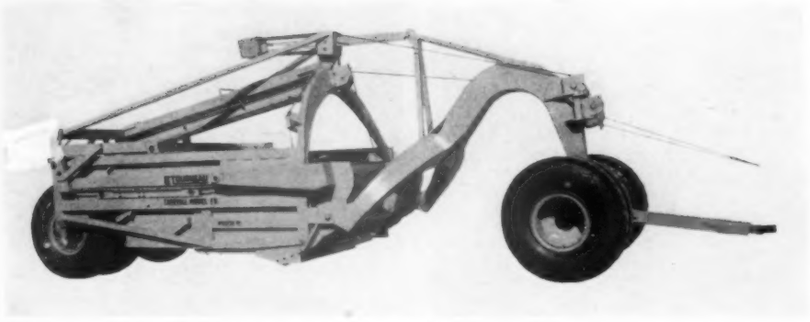
Full line of Crushers, Pulverizers, Elevators, Conveyors, Screens, Concrete Mixers, V-Belt Drives, Belting, Motors, Engines, Castings, Power Lawn Mowers and Pick-up Baling Presses.

NEW HOLLAND MACHINE CO., NEW HOLLAND, Lancaster County PENNSYLVANIA



New model double-bucket tractor scraper.

travels back on rollers and roller bearings instead of being forced back, thus reducing loading resistance and giving larger possible loads for expended tractor effort. The second or front section of the bowl is then easily heaped high with the D8 tractor power. By this unique method of loading into one bowl and rolling it back, bowl length is expanded and capacity increased.

• Screw Elevator

The Screw Conveyor Corporation, 712 Hoffman Street, Hammond, Ind., is announcing the Hammond Screw-Lift, which consists of a compact, dust-tight, moisture-proof vertical conveyor operating in a tubular casing, designed to simplify and reduce the cost of handling bulk materials. It will handle agricultural limestone, cement, slack coal, etc.

The feeder can be arranged to suit any particular need and consists of a horizontal helicoid screw-conveyor connected to the Screw-Lift. The Screw-Lift may be driven from the top or bottom and its entire weight is suspended from a top thrust bearing. Discharge is flexible.

The driving mechanism consists of a totally-inclosed lubricated drive unit with forged-steel cut-tooth gears. Timken roller bearings are provided to carry all thrust and radial loads. Additional advantages are dust and weather tightness, as well as precision workmanship. The unit is easy to erect and dismantle, has but few operating parts and the power requirement is but slightly more than for bucket elevators of similar capacity.

Screw-type elevator for finely-ground materials.

• Winches

A complete line of single- and two-drum power control winches for operating cable-controlled equipment with International Trac-TracTors and other tractors is announced by the Bucyrus-Erie Company.

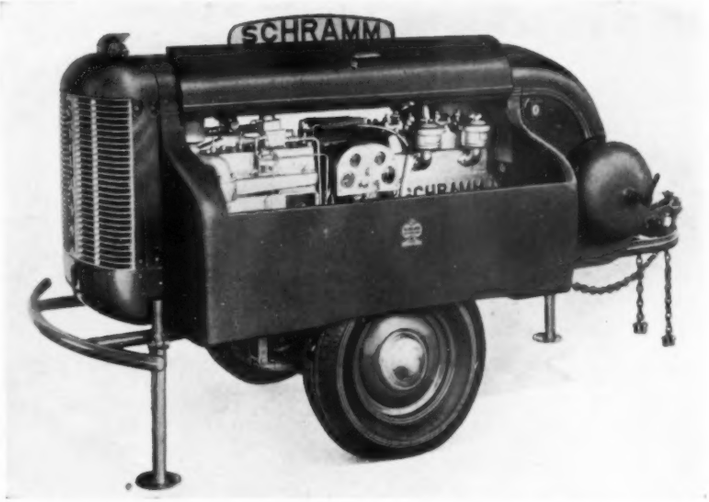
According to Bucyrus-Erie engineers, the arch enemy of dependable winch operation is excessive heat, and they claim that this trouble-maker has been completely routed in the new Bucyrus-Erie planetary-drive winch. Clutch and brake drums are separate and each drum has but one heat-generating surface; bands are external and contact 93.8 per cent. of the full circumference of the drum, spreading friction pressures over a large area so that

The Euclid Road Machinery Company has recently introduced the above new and larger self-powered earth hauler with a struck-measure capacity of 21 cubic yards. Powered with a Cummins Diesel 200-horsepower supercharged engine this Euclid has eight speeds forward ranging from 2.1 to 23.3 m.p.h.

FOR BIG JOBS . .
FOR SMALL JOBS

SCHRAMM DIESEL ENGINE DRIVE

SCHRAMM GASOLINE ENGINE DRIVE



Model 105 Gasoline Engine Driven Portable Compressor on Two-Wheel Pneumatic Tired Spring Trailer with Tool Boxes

Sizes 20 to 420 Actual Air Delivered

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SUPER "TRIPLE-S"
Bulk Conveyor Belting

The finest belt you've ever used for handling wet or dry abrasive ores; crushed limestone up to 10 inch; and other highly abrasive materials. Constructed to meet the most severe conditions of flexing. Exceptionally heavy friction between plies. Tensile strength of covers: not less than 3500 to 4000 pounds.

NOTE: For Conveyor Belting used in handling lighter materials, write for details of other GOODALL Brands.

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THE PATENTED DESIGN IS EXCLUSIVE AND DIFFERENT.

Screen Equipment Co.
INCORPORATED
LAFAYETTE AVE BUFFALO, N.Y.

Power-control winch mounted on a tractor.

less heat is generated at any one spot. All bands and drum friction surfaces are exposed to open air to assure prompt heat dissipation. Thus, say the designers, heat is carried off before it can build up to temperatures which would damage linings, ruin oil seals or cause excessive expansion and contraction with its resulting effect on clutch and brake adjustment.

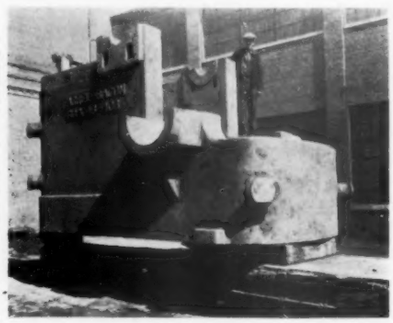
The wide, large-diameter external clutch and brake bands are interchangeable. One handy-to-reach adjustment on each band, in full view of the operator, compensates for wear. Bands are easily replaced in the field with ordinary tools, and without disturbing a single oil seal or bearing.

"Cushioned" starts and stops—thanks to big, generous brakes and clutches—lengthen rope life and protect tractors and equipment. Rope life is further safeguarded by large-diameter, properly aligned sheaves and a long lead angle to assure smooth reeving on the drum. Swinging fairlead sheaves stay properly aligned with the lead cable even on short turns.

• Pencils

To eliminate pencil-point breakage, bogey of all pencil users, one of the pencil manufacturers has pioneered in producing an almost unbreakable pencil. Unlike ordinary pencils, this one actually will not break in use. To break the point a pressure of almost 10 pounds must be exerted, and even the most persistent point-buster isn't that strong.

By actual test this pencil, called Templar DuroLead, withstands pressure of more than 250 times its own weight. The point is reinforced by using a patented lead, (U. S. Pat.



This 68-ton Meehanite casting is one of the largest ever made in the Ansonia foundry of the Farrel-Birmingham Company, Inc. The casting forms the bed of a stone crusher made for Earle C. Bacon, Inc., engineers, New York, for installation at the plant of the Kingston Trap Rock Company, Kingston, New Jersey.

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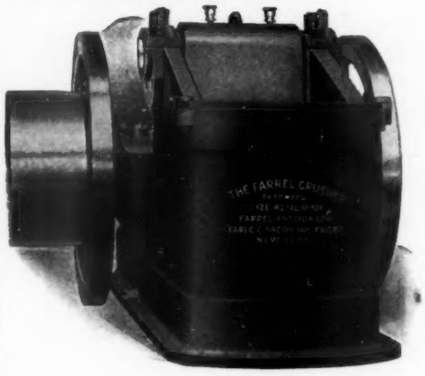
Complete plants designed and equipped, including Screens, Elevators and Conveyors. Machinery for Mines and Rock Quarries, Sand and Gravel Plants. Engineering Service



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Sounds fantastic, but Simplicity Gyrating Screens are doing this job and doing it well. Our specially designed heavy duty units are made to order for such work.

Whatever your job may be, from scalping large stone to making fine grades of material, it can be handled easier and cheaper on a Simplicity. Have our Representatives check your job and recommend a guaranteed installation of Simplicity Screens.

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Wood and lead are fused together in making these pencils.

No. 2,131,657) and a special process, fusing the wood and lead.

For office use or drawing (six graded degrees for various requirement), and, because of its strength, it is also ideal for carbon-copying, as the lead gradation is soft enough to make legible originals, yet strong enough to hold up under pressure necessary to make multiple copies.

Interested readers may secure free testing samples from their stationery and office supply dealers or by writing direct to Reliance Pencil Corporation, Mt. Vernon, New York, mentioning this magazine.

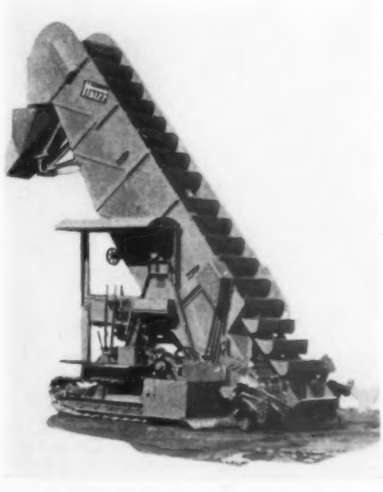
• Loader

The problem of elevating the discharge chute to load over the high sides of a 20-cubic yard truck body has led the George Haiss Manufacturing Company to work out an interesting modification of its standard loader design. With discharge chute clearance at 13½ feet with a 45-degree chute-angle setting, and to provide 7 ft. reach from the bumper, an exceptionally high elevator is required.

The design has been worked out for the Haiss Model 135, the largest machine in the line, with 36-inch buckets and a rated capacity of 5 to 8 cubic yards per minute. The noteworthy new feature is the substitution of a hydraulic lift mechanism for the usual handwheel-operated device for raising and lowering the digging end of the elevator, either for setting the digging level or lifting the elevator to a horizontal for traveling as illustrated here.

Two hydraulic cylinders or jacks are used, one mounted on either side of the elevator. The latter has been structurally stiffened to make certain that any twisting strains imposed on the shaft of the revolving paddle feeding device will not be transmitted to the hydraulic cylinders. The cylinders are actuated by oil pressure, the power being supplied by an oil pump attached to the engine of the loader. Control is via a simple two-way valve located at the operator's platform. A spring return to neutral affords a satisfactory factor of safety.

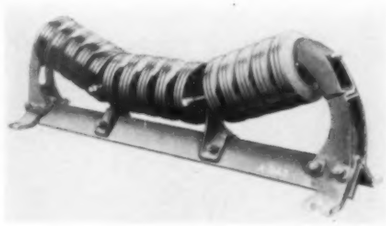
Just as truck capacities become larger and larger, loaders too grow more and more powerful. The Haiss loader shown here weighs 28,000 pounds, but handles its high capacity with only a 65-horsepower Waukesha engine. The relative fuel economy per yard handled is said to be noteworthy.



Loader with high discharge chute.

• Rubber Rollers

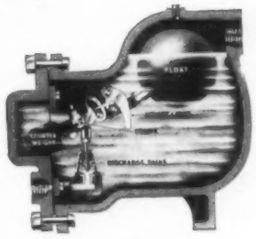
A recent development in the materials-handling field is the pneumatic roller for carriers on belt-conveyors, for use wherever the shocks of impact are excessive. It is introduced by the Stephens-Adamson Manufacturing Company. These pneumatic carriers are specially designed for use under loading spouts and in belt feeders where the impact of heavy bulk loads subject both conveyor belt and carrier to abnormal strains and wear. To cushion the impact of materials (and thereby prolong conveyor belt life), the rollers in these carriers are made up of a series of pneumatic rubber units, 6 inches in diameter, suggestive of miniature automobile tires. Their advantage over a solid roller has been compared to the advantage of the pneumatic tire for trucks and automobiles over the now obsolete solid rubber tire: greater resiliency to shock and impact and increased life.



Pneumatic rollers for belt-conveyors.

The rollers are mounted on the steel hub in which bearings and shaft are housed. Roller units have thick, wear-resisting treads and are inflated and permanently sealed to prevent loss of air. The assembly is built for easy servicing and quick replacement of damaged units.

• Water Trap



Water and oil trap.

Automatic draining of water and oil from compressed-air aftercoolers, separators, receivers and lines is accomplished with this model JR weight operated trap. It can be used for air or gas pressures up to 125 pounds as well as for saturated steam pressures up to 125 pounds.

Available in one body size only, with ½, ¾ or 1-inch screwed inlet and ½-inch outlet con-

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Order from your distributor

nections, the unit has a capacity of 2,465 to 870 pounds per hour, depending upon pressure.

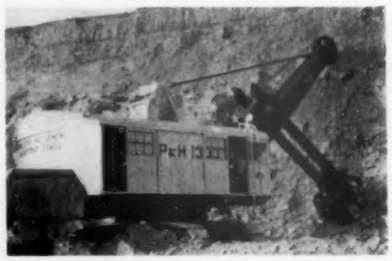
Features include a welded stainless-steel float, a water-sealed discharge valve, intermittent discharge and relatively large capacity. Body and cover are of cast iron and all internal parts are of bronze or stainless steel. Weighted operation provides for instantaneous opening and closing of the discharge valve. It is made by W. H. Nicholson & Company, Wilkes-Barre, Pennsylvania.

• Oxygen Recorder

In order to insure efficient combustion conditions in cement kilns, it is becoming a general practice to test the flue gases. One of the most reliable indications of the completeness of combustion is the percentage of oxygen in these gases, and there is an increasing demand for apparatus whereby this percentage may be accurately determined. The Cambridge oxygen recorder has proved itself to be an important element in maintaining efficient kiln operation.

Maintenance requirements are mainly limited to the usual recorder routine, inspecting the water supply to the aspirator, and daily ramming of the sampling tube. The carbon rods in the furnace will last about two weeks and can be readily replenished.

The recorder can be located any desired distance from the meter panel. The standard range of the instrument is 0-5 per cent. oxygen. The accuracy of calibration is within 0.1 per cent. oxygen.



New 3-cubic yard P & H shovel which recently went into service in the quarry of the Longhorn Portland Cement Company at San Antonio.

New and larger quarters near the Chicago municipal airport to be occupied about June 15 by the Tractor & Equipment Company, Illinois distributor of equipment used in the pit-and-quarry field. The address is 3515 West 51st Street.

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Because all pencils look alike, we ask that YOU try Templar DUROLead at our expense. Available in six scientifically graded graphite lead degrees.

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Trade Literature

Pacific Jaw Crushers, (Bulletin 114), 12 pages. Alloy Steel Metals Company, Los Angeles.

Volume-Boosting Power for Mines, Pits and Quarries, (Bulletin 6677), 16 pages. Caterpillar Tractor Company, Peoria, Illinois.

Nat-Aloy Woven Wire Screens, (Catalog No. 55), 20 pages. National Wire Cloth Company, St. Paul.

Denver Sub-A Flotation, (Bulletin F-11-B), 16 pages. Denver Equipment Company, Denver.

Load Lugger . . . a Modern Dump Truck System with Multiple Bodies, (Bulletin 44), 16 pages. Brooks Equipment & Manufacturing Company, Knoxville, Tennessee.

Telsmith Primary Breakers and Reduction Crushers, (Bulletin 261-M), 16 pages. *Telsmith Portable Crushers,* (265-C), 20 pages. Smith Engineering Works, Milwaukee.

Schramm Model 20 Portable Compressor, (Bulletin 4120). Schramm, Inc., West Chester, Pennsylvania.

Thermometers and Hydrometers, (Catalog C-40), 28 pages. George Ruehfel Company, Brooklyn.

Lo-Veyors for Conveying Bulk Materials, (Bulletin 31), 8 pages. Ajax Flexible Coupling Company, Westfield, New York.

The G-E Speed Variator, (Bulletin 3517), 4 pages. General Electric Company, Schenectady.

Sludge and Slurry Pumps, (Bulletin 207-2), 4 pages. Lawrence Machine & Pump Corporation, Lawrence, Massachusetts.

Pioneer 54V Dual Purpose Crushing and Screening Plant, (Bulletin 534), 4 pages. Pioneer Engineering Works, Minneapolis.

The Cincinnati Rubber Manufacturing Company announces the appointment of John Flocker & Company, Pittsburgh, as distributor for Pittsburgh and surrounding counties.

The National Supply Company has announced the election of Austin W. Clark as vice president. He was formerly associated with Sears, Roebuck & Company, Chicago, as assistant comptroller.

Randolph prefers Joltcrete

because of 1. High Production Rate
2. Uniform Strength of Blocks
3. Their Better Appearance

L. G. Randolph watching his two Joltcrete machines operate

Writes L. G. Randolph, who is one of over 20 manufacturers who have installed their SECOND Joltcretes:

"Contractors and builders are so well pleased with the uniformity of size, strength and appearance of the Stearns Joltcrete blocks I am producing that their approval is my assurance of correct judgment in changing to the Stearns Joltcrete Machines."

L. G. Randolph, Ann Arbor, Mich.

STEARNS JOLTCRETE accommodates all types of aggregates and permits a wide range of water-cement ratios to produce whatever character of surface texture is desired. The only equipment legally employing the important principle of Limited Amplitude Vibration—Vibration Under Pressure.

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The CONCRETE MANUFACTURER

June, 1941

A SPECIAL SECTION OF PIT AND QUARRY DEVOTED TO PRODUCTION MARKETING AND USES OF CONCRETE PRODUCTS AND READY-MIXED CONCRETE

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Divorce Capital Swings to Concrete as Reno Firm Breaks Clay-Brick Monopoly

In this view are shown the continuous-production brick machine, the skip and bucket, some of the racks, and the chutes from the mixer.

THE old adage that a rolling stone gathers no moss, like other generalities, has its exceptions. One of these is John L. Hoffman, vice-president and plant manager of the Nevada Dunbrik Company, Reno, Nevada. In his youth Mr. Hoffman was in the construction business for 9 years in Capetown, South Africa. He came to this country 20 years ago, settling in Reno. Then he specialized in general building and bridge construction and erected some of the most important structures in that bustling city. When concrete-masonry units were required these were made by hand. In 1912 Mr. Hoffman had made some drain tiles on a Dunn machine and at one time operated concrete-pipe plants at Lovelock and Winnemucca, Nevada, for sewer and irrigation projects.

In May, 1939 Mr. Hoffman went east and after looking over the block and brick situation there bought a Dunbrik machine. He put this machine in operation in Reno in September, 1939 and after making about 100,000 bricks moved it to Smith Valley, Nevada, about 100 miles south of Reno. There he made 40,000 bricks for a new school building. The machine was then moved to Gardenville, 50 miles south of Reno, where 65,000 bricks were made for a new ranch house for a state senator. The machine was then moved back to its original place in Reno, where another 100,000 bricks were made before the machine was moved to its present location in a new plant in Reno. This took place on October 16, 1940, a few days before these pictures were taken.

Up to June 5, 1940 this business was a private venture of Mr. Hoffman's. On that date the Nevada Dunbrik Company was incorporated.

The concrete bricks made by this company now sell on their merits and are specified for all types of construction. The demand keeps the plant operating at capacity. Among the orders being filled is one for 250,000 bricks for a 2-story business building, but most of the output is for houses.

Business was not always so easy to get, however. Mr. Hoffman had considerable trouble introducing this product to Reno because a large local clay-brick producer had had a monopoly for years. It was first found necessary to sell the local architects on the merits

(Continued on page 75)

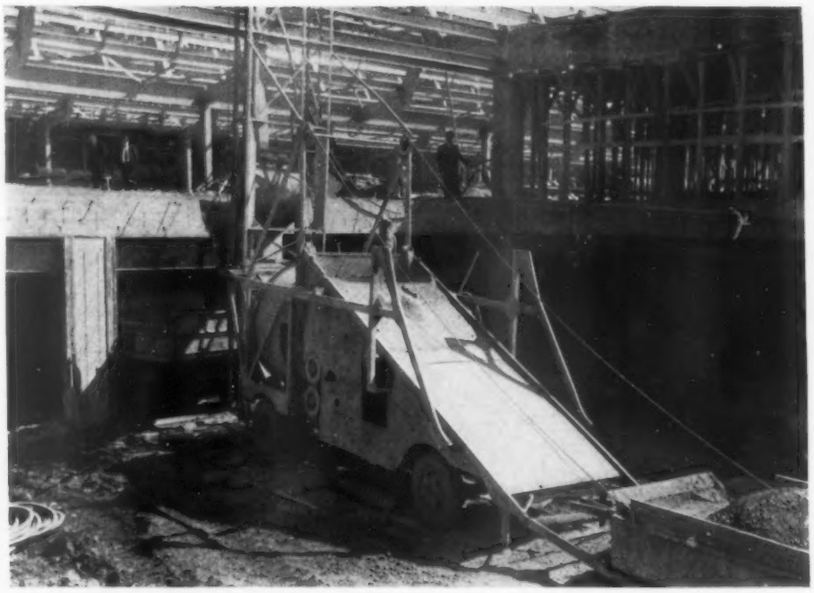
Construction Speeded Up Through Use of Modern Concrete-Production Units

THE preparation of concrete and its delivery to the forms have advanced rapidly in recent years and the modern methods employed are in sharp contrast with those of the old days when shovel-mixing and wheelbarrow transport were in vogue. Measuring the ingredients "by guess" has given way to scientific proportioning, the water-cement ratio, timed mixing, and many other advances in mixture design. Power-driven mixers have been vastly improved, mixing in transit has grown to a sizeable industry in itself,

One of the units set up inside the building, its elevator tower rising into a saw-tooth roof section.

and innumerable improvements in handling the concrete from mixer to forms, such as the pump-and-pipeline method, have speeded up construction, raised efficiency, and lowered costs. Now comes a highly-developed portable concrete plant known as the Mixermobile, which combines a loading device, mixer, and hoist in a single unit for use right on the job. It consists of a 2-cubic-yard drum-type mixer served by its own loading skip for the aggregates and cement, and a tower and hoist bucket for elevating the concrete when necessary. The hoist tower, loading skip and incline can be folded compactly for travel and the unit can be quickly set up or taken down. The equipment is all operated mechanically by one man and is mounted on a specially-constructed chassis. It has a road speed up to 45 miles per hour which

By HARRY F. UTLEY



Mobile concrete plant loading a dump truck at the Curtiss-Wright job.

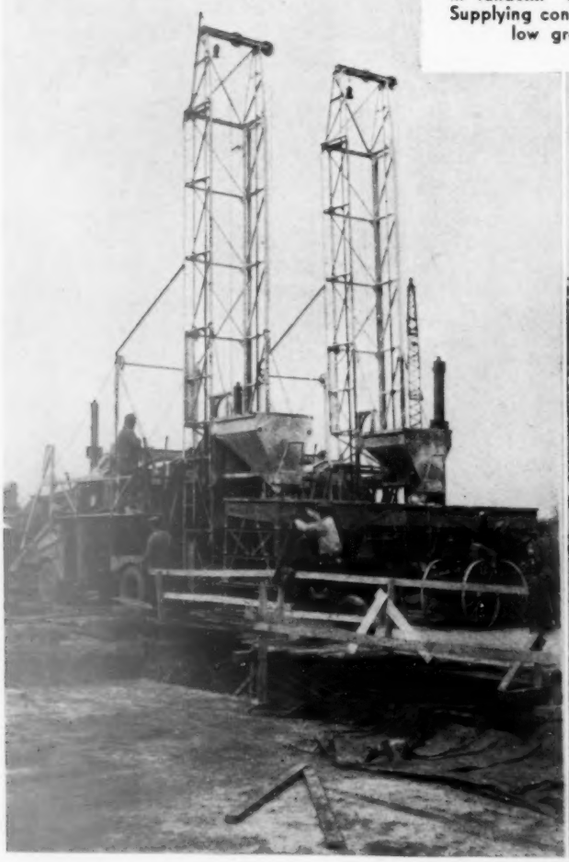
makes it extremely mobile. The present building boom, stepped up by the feverish activity of the defense program, calls for the use of these up-to-date devices to the highest degree, since speed of erection is so essential.

On a recent trip through Ohio two construction jobs were observed which were being serviced by Mixermobiles. On one of these—the new $13,500,000 Curtiss-Wright airplane-engine plant at Columbus—three of these units were in service. The concrete work has been sublet by the general contractors, Darin & Armstrong, Inc., of Detroit, to the Hilltop Builders' Supply Company of Cincinnati. The hilltop concern, which has been in the ready-mixed-concrete business at Cincinnati for several years, has a total of five Mixermobiles at present, the other two being in service at another Curtiss-Wright construction job at Lockland, Ohio, and on miscellaneous work in Cincinnati. At Columbus,

Another of the units set up at the B. F. Goodrich plant in Akron.

MAKING CONCRETE AT THE CURTIS-WRIGHT JOB

ABOVE—Some of the truck-mixers used for auxiliary service on the project. RIGHT—Mixing-and-elevating plant loading a truck-mixer. LOWER LEFT—Two of the portable plants operating in tandem. LOWER RIGHT—Supplying concrete for work below ground level.



the project involves 45,000 cubic yards of concrete which is being produced under the supervision of George H. Cooper of the Hilltop company. At times two of the units operate side by side when heavy production at the site is necessary and have poured up to 712 cubic yards of concrete in ten hours. The units operate on ground level inside and outside the buildings, and in

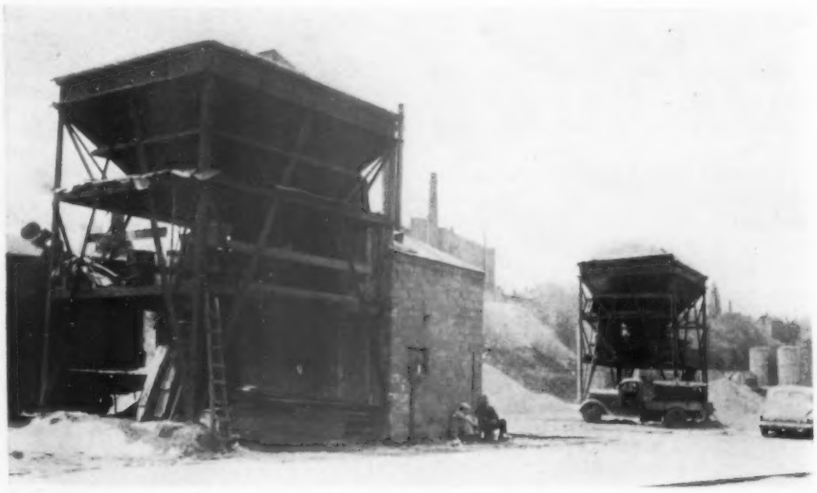
Placing concrete from tower hopper through a chute to the roof of one of the new building under construction at the Goodrich plant.

earthen declines to serve below-grade work. When production is at a rate faster than the concrete can be regularly carried away from the tower hopper, Jaeger portable double-hoppers are used as surge bins.

The Mixermobile units also serve admirably as portable central-mixing plants and Hilltop has used them to advantage in this manner to charge its truck-mixers. Four truck-mixers, three Smithmobiles and a Rex, are used to deliver concrete to remote locations on this job.

At Akron four of the large rubber companies—Goodyear, Goodrich, Firestone and General—are building extensive plant additions. Concrete is being supplied to all four jobs by the J. P. Loomis Coal & Supply Company. Two Mixermobiles were placed in service there this spring and they are moved from job to job to produce the concrete as required. The Loomis company has also used one of their units in the construction of grade-separation projects in and around Akron where relatively large amounts of concrete were used, and by so doing eliminated the expense of transporting and operating a crane to hoist the concrete. This company also uses truck-mixers to augment its Mixermobile operations. This, too, is a 1941 venture, the three Rex mixers on International trucks being charged by two small Blaw-Knox batching plants.

A number of other operators in the pit-and-quarry field have installed Mixermobiles in recent months. The Vang Ready Mixed Concrete Company of Pittsburgh is operating one, its first job being the new addition to the Linde Air Products Company plant. H. F. Thomson, head of the General Materials Company of St. Louis and former president of the National Ready Mixed Concrete Association is quite enthusiastic about the Mixermobile his company owns. In the South units are being operated by the Kelly-Smith Sand & Gravel Company of Mobile, Alabama; by the A. J. Rife Construction Company of Dallas; and the Fort Worth Sand & Gravel Company of Fort Worth. The Oman-Ferguson Company is operating two Mixermobiles at the duPont powder plant in Milan, Tennessee, and still two others



Two batching plants which serve the Loomis company's truck-mixers.

One of the Loomis truck-mixers being charged at the plant.

have been shipped to the United States Naval Base at Trinidad. In the far West where the unit was developed, important users include the Security Materials Company of Los Angeles with four Mixermobiles, the Wagner Concrete Construction Company of Portland with eight units, Henry G. Fenton Company of San Diego with two, and two each with Rhodes & Jameson in Oakland, and Harrison Brothers in Tacoma.

According to the operators, these machines owe much of their popularity to their ability to mix and elevate concrete at low cost as well as to producing a continuous flow of material. The tower can be increased to any desired height by adding extensions to the standard tower which is 35 feet. The tower hopper has a capacity of 1⅓ cubic yards (two-thirds of the mixer capacity) and the hoist bucket holds ¾ cubic yards (the remainder of the mixer capacity), three "hoists" being required to empty the drum. While the 2 cubic yards of concrete in the hopper and bucket is being placed, the mixer is preparing another 2-cubic yard batch. Meanwhile, dump trucks load the skip with batched aggregates, cement is added, and the materials are ready to be lifted into the mixer as soon as the drum is emptied. A Repeat-O-Matic precision meter accurately measures the water, which is charged into the mixing drum by a 2-inch pump. An automatic batch counter and a lock timer with a gong alarm on the mixer add to the efficiency of the unit.

When the concrete is elevated to a height of about 15 feet, each cycle requires only about 3 minutes. Top capacity is about 40 cubic yards per hour, elevated.

• Electric Lift Truck

A storage-battery-operated tier-lift truck for concrete-products plants and other industrial applications is being manufactured by the Easton Car & Construction Company of Easton, Pennsylvania.

Bulletin 162, describing this equipment, may be had by writing the manufacturer direct.

The CONCRETE MANUFACTURER

FLEET OF 36 DIESEL TRUCK-MIXERS SERVING ELWOOD-KANKAKEE ORDNANCE PROJECTS

MODERN truck-mixer fleets are playing an important part in the vast construction program involved in our all-out national-defense effort. These mechanized units of peace-time are insuring the prompt delivery of quality concrete for the huge munitions, armament and industrial works necessary to supply the implements of war to the millions of men under arms.

Construction is two or three weeks ahead of schedule on two big ordnance plants located less than 50 miles from the heart of Chicago. These are the Elwood Ordnance Plant and the Kankakee Ordnance Works. The Elwood shell-loading plant, involving an expenditure of $22,000,000 and covering 23,000 acres, and the $48,000,000 Kankakee TNT plant, located on a 27,000-acre tract, adjoin each other and a single, centrally-located batching plant serves both.

The batching plant. Cement elevator at left center.

A sub-contract for the preparation and delivery of the concrete was awarded the U. S. Transit Mix Concrete Corporation, an affiliate of the McCormick Transit Mix Concrete Company, of New York. This subsidiary has pioneered in taking large concrete contracts at distant points, shipping its plant, equipment and key personnel to the job intact. Only recently it supplied the concrete for the new steel plants of the Bethlehem Steel Company at Sparrows Point, Maryland, and Lackawanna, New York.

Two of the 36 truck-mixers in service at the Elwood and Kankakee projects.

The Elwood-Kankakee batching plant can produce more than 200 cubic yards of concrete per hour and, for the most part, was supplied by the Butler Bin Company. Its 150-cubic yard, 3-compartment steel bin is equipped with a 6-cubic yard, 4-beam scale weighing batcher. Automatic electric switches control the amount of mixing water per batch. Bulk cement is used and it is carried from the track hopper north of the plant by screw-conveyor and bucket-elevator to a 150-barrel bin above the batcher, or to storage in a 500-barrel inclosed steel bin. A small 2-cylinder Ingersoll-Rand compressor located on the batching floor supplies air for aërating the cement in the bins.

Concrete sand and gravel of 1½-inch maximum size come *via* railway from the Joliet plant of the Chicago Gravel Company. The cars discharge them into a surge bin south of the concrete plant and the material is carried forward by a 36-inch, 40-foot tunnel belt-conveyor which feeds the main plant conveyor. This inclined conveyor, 30 inches wide, has a capacity of 365 tons per hour and is 190 feet long on centers. Both conveyors were supplied by the Barber-Greene Company.

Three wells were driven to obtain mixing water which is stored in a 25,000-gallon tank. A 3-inch Chicago high-pressure pump supplies the plant's water tank from the storage tank, an automatic float switch insuring an ample supply at all times. Steam coils and live-steam released through jets heat the water and aggregates in cold weather.

Thirty-six Jaeger 5-cubic yard truck-mixers deliver the concrete, the maximum haul being about 6½ miles and the minimum just short of 2 miles. These mixers are mounted on Mack chassis powered by Cummins Diesel engines. An overload of nearly 6 cubic yards is often carried on the longer hauls. Standard Portland cement is employed for most of the concrete, although some high-early-strength concrete has been mixed and pozzuolanic admixtures are sometimes added for special construction requirements.

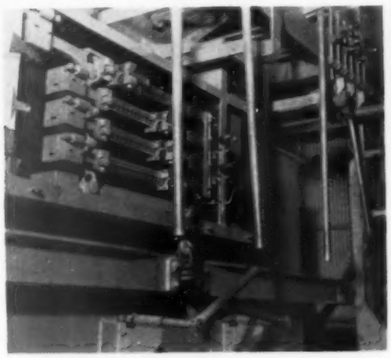
One of the truck-mixers discharging to a concrete buggy.

Looking down the aggregates conveyor toward the track hopper and tunnel.

F. M. Stewart is superintendent of the concrete plant and J. H. Dixey, vice-president, visits the operations every two or three weeks. A job laboratory at the plant is in charge of Frank Florian, a proportioning engineer of civilian status with the War Department. Here all routine tests are made and materials checked and approved. Test cylinders are sent to the Pittsburgh Testing Laboratory for concrete used on the Kankakee project while from the Elwood work Walter H. Flood & Company of Chicago are making the cylinder tests.

One of the igloos for storage of explosives.

The concrete company has a large garage and repair shop on the premises close to the batching plant, operates a maintenance truck for emergency calls and field repairs, and a Ford station wagon to facilitate visits to the many job sites. All kinds of weather have been encountered . . . from 14 below zero temperatures and the biting gales which sweep the Illinois prairies on occasion, to hub-deep mud in the spring break-up. Despite every handicap, the organization has functioned smoothly and efficiently and is justly proud of its part in keeping construction ahead of schedule. The first load of concrete left the batching plant on January 20 and by the time snow flies again it is expected the work will have been completed.



Weighing batcher and 4-beam scale.

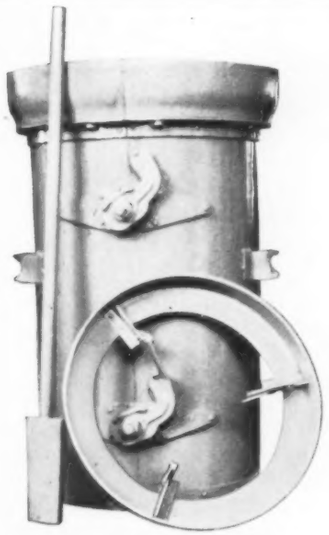
The general contractor on the Elwood project is the Sanderson & Porter Company of New York; on the Kankakee job it is the Stone & Webster Construction Company of Boston. Each works on a fixed-fee basis.

Nearly 100 miles of railroad has been laid on both sites to service the igloos, the loading lines, inert-storage and finished-ammunition buildings. More than 250,000 tons of crushed stone for ballast and roads has been supplied by the Material Service Company, the Lincoln Crushed Stone Company, and the National Stone Company, whose plants and quarries are not far away. Sites were levelled by a fleet of 16 Le Tourneau Carry-All scrapers drawn by Caterpillar 120-horsepower tractors. About $500,000 worth of coal-handling equipment was installed in the Kankakee power plant by the Stephens-Adamson Manufacturing Company.

Engineer Frank Florian in the job laboratory.

Major Elvin R. Gates is the constructing quartermaster on the Elwood job, while Major H. R. Kadlec serves the Kankakee project in a like capacity. The shell-loading plant will be operated by Sanderson & Porter and the TNT plant by the du Pont Company after they are completed and turned over to the Ordnance Department about January 1, 1942.

Buildings under construction along the "loading lines."



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By I. BENCOWITZ
Texas Gulf Sulphur Co.

MANUFACTURING SULPHUR PIPE

THE need of a cheap pipe which will withstand corrosive fluids is well recognized by chemical and civil engineers. On the other hand, the fact that sulphur is inert to many corrosive fluids, coupled with its well-known usefulness as a cementing medium, suggest it as an ideal material for pipe construction.

R. F. Bacon and H. S. Davis were the first to suggest the use of sulphur for the construction of acid-resistant pipe. A few years later, 1928, W. F. Bleecker took out a patent on the utilization of sulphur for lining pipe. Nevertheless, as late as 1933 no experimental data were available as to the feasibility of manufacturing sulphur pipe nor could one find data which would yield an inkling as to the possible physical properties of such pipe. Sulphur cements of great strength were known. However, this did not necessarily indicate that sulphur pipe of large diameters or sulphur lining would stand up with time in service. On the contrary, the thermal stresses and crystallization changes which are associated with sulphur, coupled with the geometry of a pipe, justified reasonable doubt of the practicability of such a project. Accordingly, the research laboratories of the Texas Gulf Sulphur Company undertook a systematic investigation to determine whether sulphur pipe can be made, to find out the possible difficulties and the methods of avoiding them, and then to study the physical properties of the best pipe that can be made under the best conditions. It was a research problem and not a development problem.

Methods of Casting.—After several trials with what seemed simpler methods of manufacture the procedure finally adopted was that of centrifugal casting. In the design of the mold much was borrowed from the recorded experience of those who pioneered in the field of centrifugal casting of concrete as well as cast-iron pipe. In so far as sulphur pipe is made of a cementing medium and irregular aggregate the problem is similar to that of concrete. On the other hand, since the formation of a sulphur pipe is accompanied by temperature changes and induced thermal stresses the process was not unlike that of cast-iron casting.

The machine finally designed and used in these experiments is shown in Figure 1, diagrammatically, and in Figure 2. It consists of a steam-jacketed shell mounted on rollers and driven by an end shaft attached to one end of the mold. This shaft is hollow, allowing steam to enter and leave the mold while in motion at 1,000 r.p.m. The open end of the mold is provided with a removable open flange projecting beyond the inside circumference of the mold sufficiently to retain the desired wall thickness of the finished pipe.

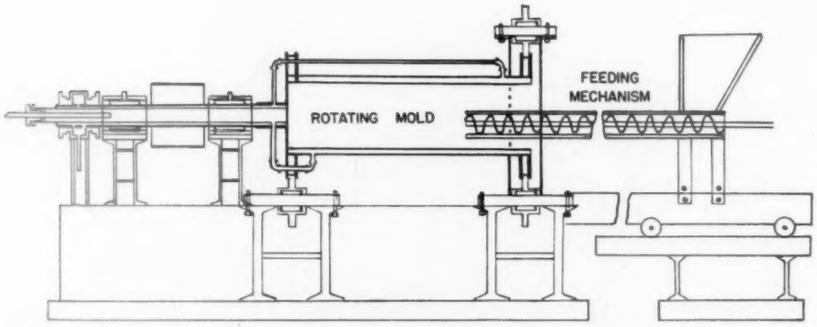

Figure 1. Machine for casting sulphur pipe.

The feeding mechanism consists of a steam-jacketed screw-worm carrying at the furthest end a steam-jacket hopper. The translational motion of the mechanism is so arranged by means of clutches and a reversible motor that when it moves forward into the mold the worm-screw does not revolve. However, as the translational direction is reversed and the mechanism begins to withdraw, the feeding screw begins to revolve, depositing the hot sulphur mix evenly along the entire length of the mold. The fluidity of the mass contributes the uniformity of the distribution. While the centrifugal force compresses the aggregate densely it squeezes out the excess sulphur toward the inside of the forming pipe, whence it runs out through the open end of the mold. A guard, not shown in the figures, confines the sulphur spray to a limited area and thus protects the operator from possible injury and helps return the excess material to the mixing pot.

Figure 2. Charging feed hopper before starting machine.

Choice of Aggregate.—Sulphur itself possesses very little strength. Furthermore, liquid sulphur on cooling develops stresses due to rapid temperature changes and delayed crystallization. It is desirable to incorporate in the wall structure of the pipe only sufficient sulphur to fill the voids of the aggregate and to cement the particles together. The voids of the aggregate should not be too large. On the other hand, the aggregate, which must provide the ultimate strength of the pipe, should contain a considerable percentage of large particles with the fines. The most nearly ideal aggregate, however, is a fibrous substance such as asbestos. But good pipes were made with graded crushed gravel and with graded coke. In Table I are given the compositions and physical properties of the best pipe made in this work.

Difficulties Encountered.—The first difficulty encountered was the inability to remove the pipe from the mold. This was finally overcome by casting inside the mold, a shell of pure sulphur which need not be more than ¼ inch in thickness. This sulphur layer, as soon as it is solidified, is dusted with some fine powder such as limestone. The hot mix is followed. As soon as the pipe is formed the machine is stopped and steam turned on. Within a few seconds enough sulphur is melted away from the outside sulphur shell to

loosen the pipe. Withdrawal is then easy. In Figure 3 two men are shown removing a completed sulphur pipe. The outside shell of sulphur which comes out with the pipe can be peeled off readily, leaving a smooth surface.

Another difficulty which gave considerable concern was the formation of spiral bridges on the inside of the pipe. A similar difficulty was observed in the early stages of the centrifugal casting of cast-iron pipe. At that time it was ascribed to faulty alinement and balancing of the casting machine. This no doubt was the cause for the ridges in sulphur pipe. However, it was also due to the fact that at this stage of this work the charge was designed to be completely retained in the mold as the wall structure of the pipe. This necessitated a mix of heavy-mud consistency. To increase the fluidity by increasing the proportion of sulphur resulted in an excess of sulphur in the wall.

The difficulty was overcome by increasing the fluidity of the mix with a large excess of suphur; this excess was then allowed to run out of the mold as the centrifugal force pressed the aggregate densely together, squeezing the excess sulphur towards the center of the mold. A sufficient quantity of the mix is added so that the volume retained as the wall of the pipe consists of dense aggregate.

Properties.—The following tests were made on pipe with a 1⅞-inch wall thickness. But satisfactory pipes were made with a wall structure of 1- and ½-inch thickness. The hydraulic strength was determined after the pipe had been subjected to several thermal shocks (T.S.). Each shock consisted of submerging the pipe in boiling water for 5 minutes, removing it and immediately placing it in a water bath at room temperature. After 5 minutes in the cooling bath the cycle is repeated. Our best pipe, made with asbestos as aggregate, withstood a hydraulic pressure of 95 p.s.i. after it had been subjected to 30 thermal shocks. Pipe made with coke and sand and a little asbestos withstood 85 p.s.i. after 80 T.S., while pipe made out of two sizes of crushed gravel withstood 75 p.s.i. after 27 T.S.

The compressive strength of these pipes is best illustrated in Figure 4. Fourteen hundred fire bricks, weighing 8 pounds each, were placed on two pipes as shown and allowed to remain for 18 hours.

Figure 4. Compression test on centrifugally-cast pipe. The brick weighed 11,200 pounds.

The chemical resistance of these pipes was tested by placing them in sulphur-mine bleedwater, a highly corrosive fluid. In Figure 5 are shown pipes which had been in such bleedwater two years. These pipes are still in good condition after eight years of severe weathering.

Figure 5. Centrifugally-cast sulphur pipe after two years service in sulphur-mine bleedwater and eight years of weathering.

Lining Pipe.—In Figure 6 is shown a machine used for lining steel pipe. Pipe up to 20 inches in diameter can be accommodated by this machine. The photograph shows a 12-inch pipe ready to be lined. A collar on each end of the pipe determines the thickness of the lining. The feeding mechanism, only partly shown in the figure, is somewhat different from that described above. The entire mechanism, filled with the sulphur-aggregate mixture and kept hot by a steam jacket, is shoved into the pipe to be lined. As the pipe revolves the feeding trough is turned over and the mix is dumped out along the entire length of the pipe. This reduces the time of charging. When the lining is solidified, the machine is stopped, the feeding device withdrawn and the lined pipe removed by releasing the latch on the clamp holding the pipe in place. As is the case with casting sulphur pipe, so it is with lining pipe, the aggregate is either fibrous or graded solid particles, coke or gravel. But the aggregate must be such as to form the body of the lining. The charge is made very fluid by a considerable excess of sulphur, the excess being allowed to flow out of the pipe while it spins.

The pipe may be preheated but this is not essential. Before introducing the mix for the lining proper it is sometimes desirable to cast a film of asphalt. This results in better adhesion of the sulphur lining and provides an intermediate, elastic layer to take up the difference in temperature expansion of the shell and the lining. However, successful linings were made without such an intermediate asphaltic layer. Linings ¼ inch in thickness are satisfactory. Our earlier linings were made 1 inch and ½ inch in thickness.

In Figure 7 are shown two views of the same sulphur-lined pipe before and after three years of service in brine water. Hardly any effect could be detected on inspection. To illustrate the severity of the test an ordinary steel nipple

Figure 3. Removing completed pipe from centrifugal mold.

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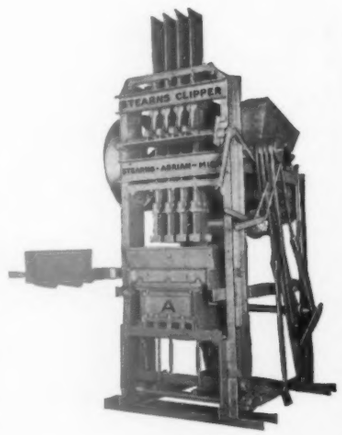


The Clipper Stripper, shown above, available in 5 models, is only one of the popular machines in the ANCHOR Line of Complete Equipment for the Concrete Products Plant. ANCHOR Engineering Service in the design of new plants or revamping older operations is nationally famous. Consult us before you buy equipment or modernize your plant . . . it costs no more.

Hobbs block machines, Anchor tampers, Anchor, Jr. strippers, Stearns power strippers and Jolterete, Stearns mixers and pallets, Straublox oscillating attachments, etc. Repair parts for: Anchor, Ideal, Universal, Stearns, Blystone mixers and many others.

ANCHOR CONCRETE MACHINERY CO.
G. M. Friel, Manager Columbus, Ohio

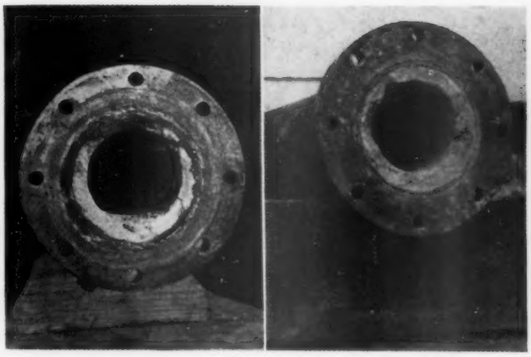


Figure 7. Sulphur-lined steel pipe before brine service at left, and, at right, after three years of service in brine.

Figure 8. Ordinary steel nipple after a year in brine service.

Table I—COMPOSITION AND STRENGTH OF BEST PIPE*

Pipe No.	Weight per (*pounds per linear foot*)	Volume					Weight (*per cent.*)					Strength		Number of Thermal Shocks	Density
		Sand	Coke I	Gravel I	Gravel II	Asbestos	Sulphur	Sand	Coke	Gravel	Asbestos	Internal Hydraulic Pressure (*p.s.i.*)	Tensile (*p.s.i.*)		
105	34	.....	.....	.....	.....	1	83	.....	.....	.....	17	95	152	30	1.77
101	35	1	1	.....	.....	4.2	66	16	7	.....	11	85	136	30	1.87
100	35	1	1	.....	.....	2.3	57	23	11	.....	9	65	104	23	1.87
84	38	.....	.....	1	1	1	35	.....	.....	60	5	75	120	27	2.23

*Length, 37 inches; wall thickness, 1⅞ to 1½ inches.

SCREEN ANALYSIS OF AGGREGATE

Standard Screen Mesh		Analysis (*per cent. by weight*)			
Through	On	Sand	Coke I	Gravel I	Gravel II
3	10	.....	31.5	.....	.....
10	20	2.5	30.1	45	.....
20	40	94.0	.....	.....	.....
20	60	.....	.....	.....	100
40	.....	3.5	13.4	40	.....

after less than one year in service is shown in Figure 8.

Conclusion.—It must be pointed out that the chief object of this investigation had been to determine the feasibility of making sulphur pipe and to determine the properties of such pipe. The results justify the belief that sulphur pipe can be made commercially and that it is of sufficient strength to make it serviceable in many fields of application. On the other hand no attempt was made to develop the best or the most economical method of manufacture. Many possible and perhaps better methods than those described can be employed. Existent equipment in old plants may be utilized after slight modification. The difficulties of manufacture are not great, while the need of a pipe or a lining with the characteristics described above is considerable.

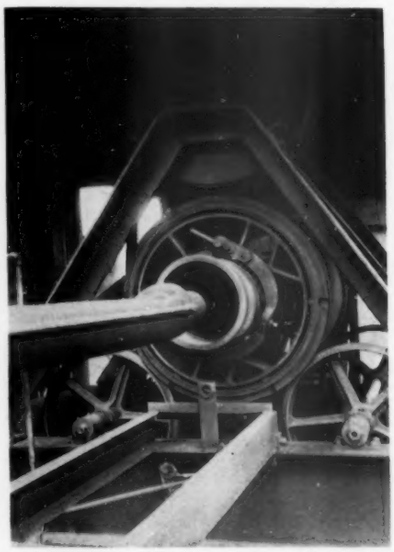


Figure 6. Centrifugal machine for lining steel pipe with sulphur.

Thomases to Construct New Plant at Lawton

A concrete-products plant representing an initial investment of $30,000 is shortly to be erected on a 5-acre tract at Lawton, Oklahoma by the Thomas Concrete Pipe Company of Ada, Oklahoma.

The business is owned by C. A. Thomas and his sons Luis and Churchill.

FOR SALE

An exceptional opportunity to purchase a complete Concrete Block plant, in a middle-western city where the demand and sale of concrete blocks has been exceptionally good. The plant includes one Anchor 16-inch machine, mixer, 6000 pallets, conveyors, 3 motor electric pumps, 5 kilns, drag, building and 6½ acres of land. Owner wishes to retire. If you are interested communicate with

MODEL CEMENT STONE COMPANY
2224 East 36th St., Minneapolis, Minn.

Reno Brick (from page 66)

of concrete bricks and this was done by means of a few demonstration houses and the large out-of-town jobs mentioned above. The variety of colors also helped and they immediately found favor with local bricklayers.

The Dunbrik machine makes the 2½- by 3¾- by 8-inch brick which is in demand in most sections of the West. This size of brick is preferred because of its better adaptability to different types of architectural treatment and because labor and wall costs are lower than when the smaller brick standard in other sections is used. In this plant about 144 bricks are obtained from a

John L. Hoffman, vice-president, and his son, Eric, who operates the plant.

mixture of 720 pounds of sand and a sack of cement. These bricks have a high compressive strength and a resistance to moisture penetration far better than that of the local clay bricks.

Bricks are made in solid colors with Dunn Colortex mixed with the concrete. Mat-glazing is usually done on completed walls with deep raked joints. Much of this is done in white on exteriors to take the place of stucco.

A method has also been developed

A rack-load of bricks being moved into the curing room with a hand-lift truck.

for mat-glazing in the plant. The cured bricks are placed on a vibrating table. The color and sand are then sprayed on and vibration produces a glossy surface. Bricks colored in this manner have been sold mainly for interior use, but efforts are being made to sell them in competition with terra-cotta for exterior use.

The plant is located on a railroad siding a few blocks from the main business district of Reno. Cement is received by railway and railway shipments of the plant's products are sometimes made. Aggregates are purchased from local producers and are delivered to the plant in trucks. The equipment used consists of the standard Dunn skip, mixer and Dunbrik machine. Later Mr. Hoffman plans to install a Dun-Tex roof-tile machine. The bricks are loaded on Dunn steel racks, and a Dunn lift truck is used to haul the loaded racks away for curing. The brick-lined kiln has a capacity of 12 racks holding 720 bricks each. Bricks are cured in steam at 5 pounds pressure for 24 hours before they are moved outdoors and sprayed for 3 or 4 more days. A Clark gasoline Truc-lift is used for this hauling.

This view of the plant was taken a few days after it went into operation. The gasoline lift truck shown had not yet been used.

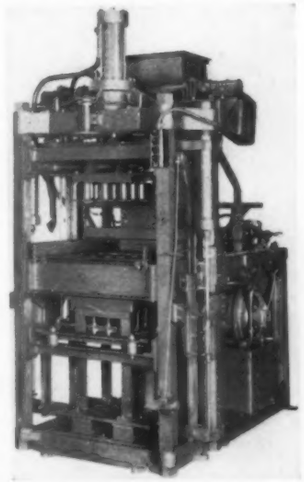
The CONCRETE MANUFACTURER

Will not BREAK, CRACK or WARP

70% of the Vibrators are using Commercial Cored Steel Pallets — and there must be a reason for their use — because there are other kinds, but Commercial Pallets are made to fit the machine. They do not wear out. Many Companies have used the same Commercial Pallets for years, — with no apparent wear. And the cost is reasonable for long time wear — and perfect blocks.

THE COMMERCIAL SHEARING AND STAMPING CO.
YOUNGSTOWN, OHIO

Why not BUY the LATEST FASTEST and BEST PRODUCTION BLOCK MACHINE



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Write for information.

KENT MACHINE CO.
Cuyahoga Falls, Ohio

Three Batching Plants of Haden Company Serve 22 Truck-Mixers

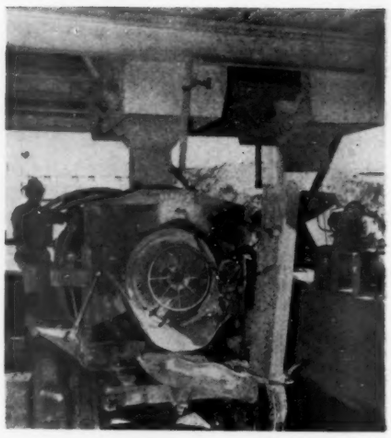
ONE of the outstanding exponents of diversification in the non-metallic-minerals industries is W. D. Haden, president of the Haden Lime Company, Houston, and of the W. D. Haden Company, Galveston, Texas. The lime company operates a modern rotary-kiln plant which makes lime from oyster shells. The other company produces and distributes sand and gravel, crushed shells, ready-mixed concrete and lime putty. This article is concerned with the two last-mentioned.

The W. D. Haden Company began the production of ready-mixed concrete in 1932 with a fleet of six 1½-cubic yard truck-mixers and a 55-cubic yard batching hopper at its Jefferson Street yard near downtown Houston. Now it operates a mixer fleet which has a total capacity of 35 cubic yards and three batching plants are maintained. In 1934 a batching plant was built at Greenbrier Street and the Southern Pacific Railway in a rapidly-growing residential section in the southwestern part of the city. In 1937 a batching plant was erected at Sims Bayou, east of Houston, where the company's shipyard is located and where all its shell for distribution in this area is unloaded from barges and stored. In 1938 a new Blaw-Knox batching plant was erected at the Jefferson Street yard. Earlier a lime-putty plant had been erected. The company's newest plant was erected at the Greenbrier Street yard in June, 1939, replacing the old batching plant there.

The new Jefferson Street plant was built adjacent to the old plant and both use the same 10-foot-deep truck-loading tunnel, which is kept dry by an automatic pump. The 2-compartment bin of the old plant is used for the storage of torpedo sand and ¾-inch gravel. A 2-cubic yard batcher with a Kron dial scale is used for dry-batching or when special concrete mixes are required In the latter case truck-mixers are loaded in two stops.

A Lorain 55-B crawler crane is used to load the bins of both plants from cars or stock-piles. The 4-compartment 160-cubic yard Blaw-Knox bin of the new plant is used for the storage of shell, San Jacinto (concrete) sand and 1½-inch gravel The top of this bin is only 32 feet above the track level. The aggregates are fed, through four manually-operated clam-shell gates, into the 2-cubic yard Blaw-Knox aggregate-weighing batcher, which is equipped with a Fairbanks springless dial scale. The shell is used in concrete for drives, walks, floors and other flat work where low cost is more important than strength.

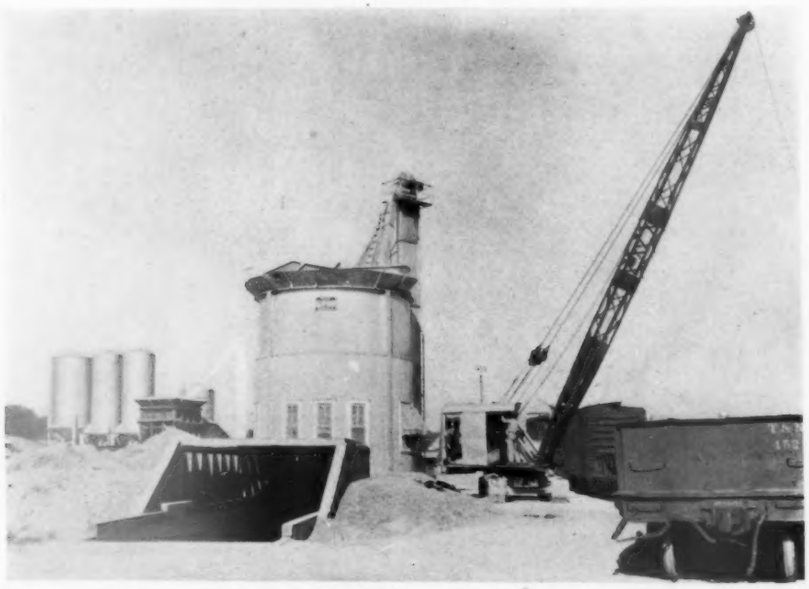
Bulk cement is received in box-cars, from which it is unloaded into a screw-conveyor followed by a bucket-elevator. The cement is stored in a 3-compartment, 600-barrel Blaw-Knox bin. Air for agitation of the cement in this bin is supplied by a Kellogg compressor. The cement is fed, through three Blaw-Knox rotary valves, into a 2,000-pound-capacity Blaw-Knox weighing batcher equipped with a beam scale and an over-and-under indicator.



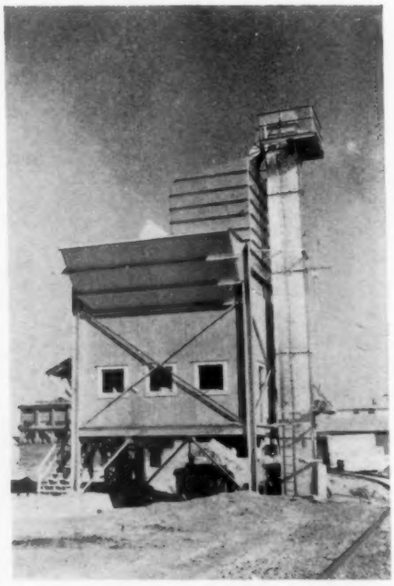
Loading a truck-mixer at the Greenbrier Street plant.

The contents of both batchers are discharged into a hopper, which has a telescoping spout for feeding the truck-mixers. Water is measured in a Blaw-Knox siphon-type volumetric tank and is discharged through the hopper into the truck-mixers.

The new Greenbrier Street plant has a service track on one side close to the plant and one on the opposite side about 65 feet away Sand and gravel are stock-piled on the far side of the near track and in piles extending from the plant in both directions parallel to the track. Shell is stored between the far track and the plant. This system gives

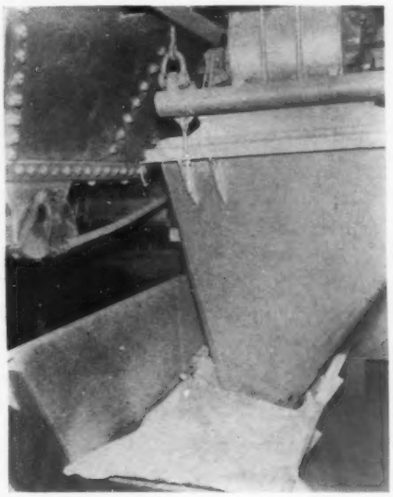


The Jefferson Street yard with truck-loading tunnel under the old and new batching plants. In left background is the lime-putty plant.



The Greenbrier Street plant. Note cement bin extending above the aggregate bin.

the greatest-possible storage capacity within reach of the plant in one handling. The truck-loading tunnel under this plant is only 3½ feet deep and the top of the aggregate-bin structure is only 30 feet above track level. All the aggregate handling is done by a Northwest crawler crane with a 50-foot boom and a 1-cubic yard Hayward clam-shell bucket. The plant aggregate storage



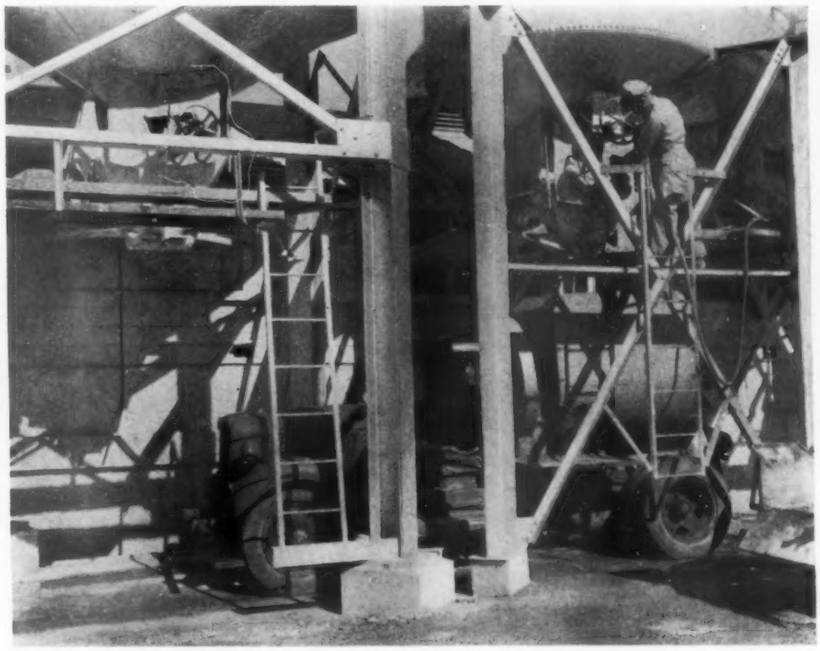
Aggregate and cement batchers at the Greenbrier Street plant.

consists of five 35-cubic yard bin compartments.

Bulk cement is unloaded from cars into a chute by a Link-Belt automatic power scraper, and a bucket-elevator discharges it into two 250-barrel compartments of the Blaw-Knox steel bin. These compartments extend to a height of 12 feet above the tops of the aggregate compartments.

The aggregates are weighed in a 2-cubic yard Blaw-Knox batcher which is equipped with a Fairbanks dial scale. Cement is weighed in a 2,000-pound batcher which is also equipped with a Fairbanks dial scale. The cement-weighing batcher is located slightly above the aggregate batcher so that the cement can be discharged into and through the latter simultaneously with the aggregates. This arrangement saves several feet of head-room. Water is measured in a siphon-type tank. These ingredients are discharged into truck-mixers through movable spouts on a track under the batchers. On this track is a short spout for the larger and higher truck-mixers and a long spout for the smaller truck-mixers.

The fleet of 22 truck-mixers includes two 5-cubic yard Jaegers and a 3-cubic yard Blaw-Knox machine. These are mounted on Mack EJ tandem trucks with two dual-tired wheels on each of two driving axles. This type of drive has been a great advantage in wet weather. The other truck-mixers are all 1½-cubic yard machines (Jaeger and Blaw-Knox) on International and Ford truck chassis. It has been found that skilled operators can so time the discharge of the sand, gravel, cement and water that 2 cubic yards of concrete can be loaded into the 1½-cubic yard mixers without exceeding their rated limit of volume content.



Loading lime-putty into an open-top truck-mixer at the Jefferson Street ageing plant.

The lime-putty plant at the Jefferson Street yard is of the tank type which has become popular in recent years. The lime is first slaked and is then pumped into eight 700-cubic foot concrete tanks. After aging for a week the putty is pumped into three larger tanks for further aging. The two original tanks hold 1,400 cubic feet each; the third 3,000-cubic foot tank was added two years ago.

Most of the lime-putty output is sold in the form of ready-mixed mortar and a bucket-elevator-and-bin set-up is used to load the sand into the truck-mixers. Two Concrete Transport mixers are used for this work and other truck-mixers are also pressed into this service when needed. The capacity of this plant is about 50 cubic yards of mortar daily.

Weighing batchers and scales in the new Jefferson Street batching plant.

Canton Concrete Maker Adds Bulk-Cement Plant

The bulk-cement plant as erection was nearly completed.

The batching plant and crane which loads aggregates into the bins.

FROM a small beginning just four years ago, the Diano Supply Company has enlarged its ready-mixed-concrete operations to such an extent that it is now the leading supplier of this material in bustling Canton, Ohio. The company has aggressively merchandised its product and won the confidence of builders and architects. As a result, its truck-mixers are kept busy delivering quality concrete for a wide variety of construction work. Close watch is kept on control, and specifications are strictly adhered to. The plant is centrally located to serve Canton and its environs so that the length of haul is kept at a minimum. All equipment is well maintained and kept up to date.

The Diano company's Heltzel-built batching plant is inclosed with corrugated metal and wooden siding. The aggregates are received by railway and held in open storage. They are handled and loaded into the 72-ton, 3-compartment plant hopper by a Model 48 General excavator equipped with a ⅜-cubic yard clam-shell bucket. Two of the compartments store coarse aggregates and the third, sand. A standard Heltzel truck-mixer-type batcher suspended on a Kron dial scale is used to proportion the material into the drums.

Bagged cement had been added at a storehouse adjoining the plant until this spring when the Diano company investigated the economy and convenience of using bulk cement and erected a Heltzel 300-barrel Model E-2 bulk-cement plant. This plant straddles the truck-mixer driveway and adjoins a railway spur where an under-track screw conveyor feeds the elevator which rises 42 feet to the top of the steel cement bin.

Three of the eight truck-mixers now in service.

The neat, well-kept office building.

A Heltzel dustless cement batcher measures the cement by weight. Full-bin signals and an air-jet system at the throat of the bin are features of the installation. It is estimated that savings of 10 to 15 cents per cubic yard of concrete will accrue through the use of bulk cement.

When operations were started back in 1937, two truck-mixers were used. Recent additions have built this up to a fleet of eight. All are Jaegers, four of 2-cubic yards capacity being mounted on Ford trucks, the other four being 3-cubic yard mixers on Mack chassis.

The offices front on the street with the batching plant, garage, etc., at the rear. Since the neighborhood is largely residential the office building, built a year or so ago, is a residential-type structure. It is surrounded by a well-kept lawn and neat plantings of shrubs and evergreens.

The Diano company is also engaged in general contracting, has been for many years. It specializes in the laying of sewer, water and gas mains. Anthony Diano heads the concern and supervises all activities, including the ready-mixed-concrete end of the business.

Study Reveals Causes of Business Failures

The questions uppermost in the mind of a man starting in business, or planning to, are—Will I survive? Will I stick it out?

Related questions which probably also come to his mind are—What are the hardest years to weather? When do most people, who find the going too hard, drop out?

An attempt to answer these questions, factually, has been made, with reference particularly to the small business man, in the fields of retailing, manufacturing, wholesaling, and services in Monograph No. 17, *Problems of Small Business,* by the Temporary National Economic Committee. It is available from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 40 cents.

The answers must not be regarded as complete and final, because no thoroughgoing survey has been made of the Nation as a whole. The findings are based on the experience of a few selected cities in the country whose business histories go back for some time into the past.

The probability is that these experiences are fairly typical—still there is no way of proving, without a costly canvass, that what goes for Poughkeepsie, New York, must also go for, say, Elgin, Illinois.

These findings are not presented either to discourage or encourage a man to start in business. They are given rather as life insurance tables are presented, not to encourage a sunny or gloomy view of life, but only to indicate its probability in terms of years.

Too many factors enter into the success of one man in business and the failure of another, to make possible any formula which might account for either. Failures are known to have resulted from over-optimism, lack of initial capital, inability to appraise his community's needs, an over-eagerness to expand, poor credit control, poor management, and a number of other causes.

The present findings may be used, however, as at least one of the aids to the business man in estimating, with some degree of soundness, his "chances" of staying in business once he has begun.

It can not be over-emphasized that mortality of business enterprises is not chiefly a function of business depressions. The growth of business, as with the increase of population, presupposes an increase in the number daily. An over-optimistic increase in the number of establishments would naturally result in a mounting rate of entry and subsequent closure.

Ready-Mix Industry Not Covered by Law

In response to a request for an opinion presented by the National Ready Mixed Concrete Association last year, the Wage and Hour Division of the U. S. Department of Labor ruled that the ready-mixed-concrete industry was not covered by the Wage and Hour Law simply because its concrete was used in the repair or reconstruction of essential instrumentalities of interstate commerce like highways, streets or bridges, or buildings in which goods for interstate commerce, of which the concrete is not an ingredient, were manufactured.

In several instances, however, enforcement officers of the Division attempted to take the position that if cement were used which originated at interstate points of origin, ready-mixed-concrete companies were covered by the Wage-Hour law even though the concrete itself did not cross state lines. This policy was not supported by the Division, however, and it consented to cancellation of such enforcement actions.

Starts Production of Lightweight Units

The San Joaquin Valley Pipe & Construction Company is starting production of lightweight concrete—masonry units at a plant in Chowchilla, California. Volcanic ash and other lightweight aggregates are being used.

The product will be marketed under the trade name "Vitralite."

A new cinder-block plant with a capacity of 1,000 units daily has been built by the Guyan Cement Products Company of Pineville, West Virginia.

• New Truck-Mixer

The Ransome Concrete Machinery Company, Dunellen, New Jersey, has announced the marketing of their new Hi-Up truck mixer designed for a higher point of discharge and differing in several fundamentals from present designs.

According to Ransome, the Hi-Up drum rollers are positioned under the center of gravity of the drum practically balancing the load and relieving the strain on the front pedestal bearing. This provides the machined drum track around the center of the drum which tends to act as a reinforcing band where the impact of the intake load is the heaviest and eliminates the long span of light steel drum shell found where the drum track is at the discharge end of the drum and the pedestal bearing at the front. Accessibility to all operating parts is claimed by the manufacturer.

Because there are no drum rollers at the discharge end of the mixer the mixer frame is shorter offering a more satisfactory mounting on truck chassis. Also because there are no supporting members ordinarily required for the drum rollers at the discharge end of the mixer the Hi-Up may be backed closer to forms and discharged without the use of the chute although a two-piece chute is standard equipment.

The new model is designed for combination top or end loading.

New truck-mixer features high discharge.

HELTZEL Bulk Cement Plant Operators Produce More Ready-Mix Concrete per Hour at a Lower Cost per Yard

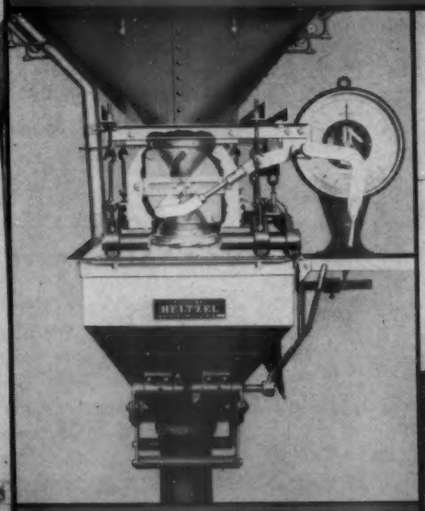
Standard Equipment from 100 to 1500Bbls.

Units Available to Fit Any Yard Set-up . . .

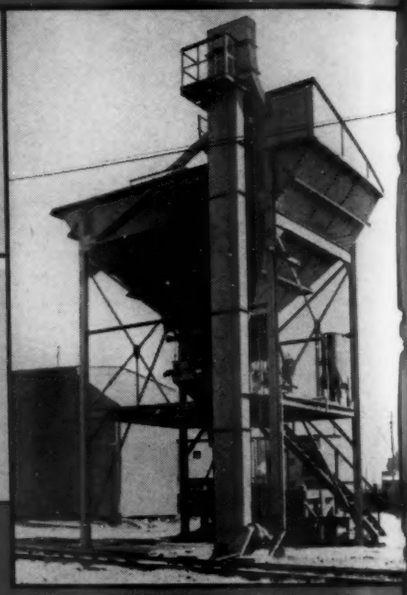
Portable . . . Semi-Portable . . . Stationary

. . . . Investigate Today . . . .

Ask for Heltzel Bulletins T-28 and B-31



Cut away view of Heltzel Dustless Bulk Cement Batcher. Note water-tight Rubber Valve between bin hopper and batcher. All Heltzel Bulk Cement Plants are equipped with this batching unit.



Heltzel Combination Batching Plant. Accommodating 200 tons of aggregates and 325 bbls. of cement for weight batching all aggregates and cement in one operation.

Heltzel Model E-2 Semi-Portable Bulk Cement Batching Plant. 300 bbls. capacity. Note especially large driveway clearance.

Heltzel Model E-1 150 bbl. Portable Bulk Cement Plant with built-in elevator. Plant may be quickly and easily moved from one location to another without dismantling elevator casing, chain or buckets.

600 and 1500 bbl. Bulk Cement Tanks accommodating 4 grades of cement. 50 cu. ft. batchers suspended on Springless Kron Dial Scales. Tanks charged with the Heltzel Air-veyor system.

HELTZEL STEEL FORM & IRON CO.

ABSOLUTELY, YOU CAN MAKE MORE MONEY with JAEGERS

CHARGE FASTER
MIX FASTER
DISCHARGE FASTER

EITHER
HIGH DUMP
TYPE

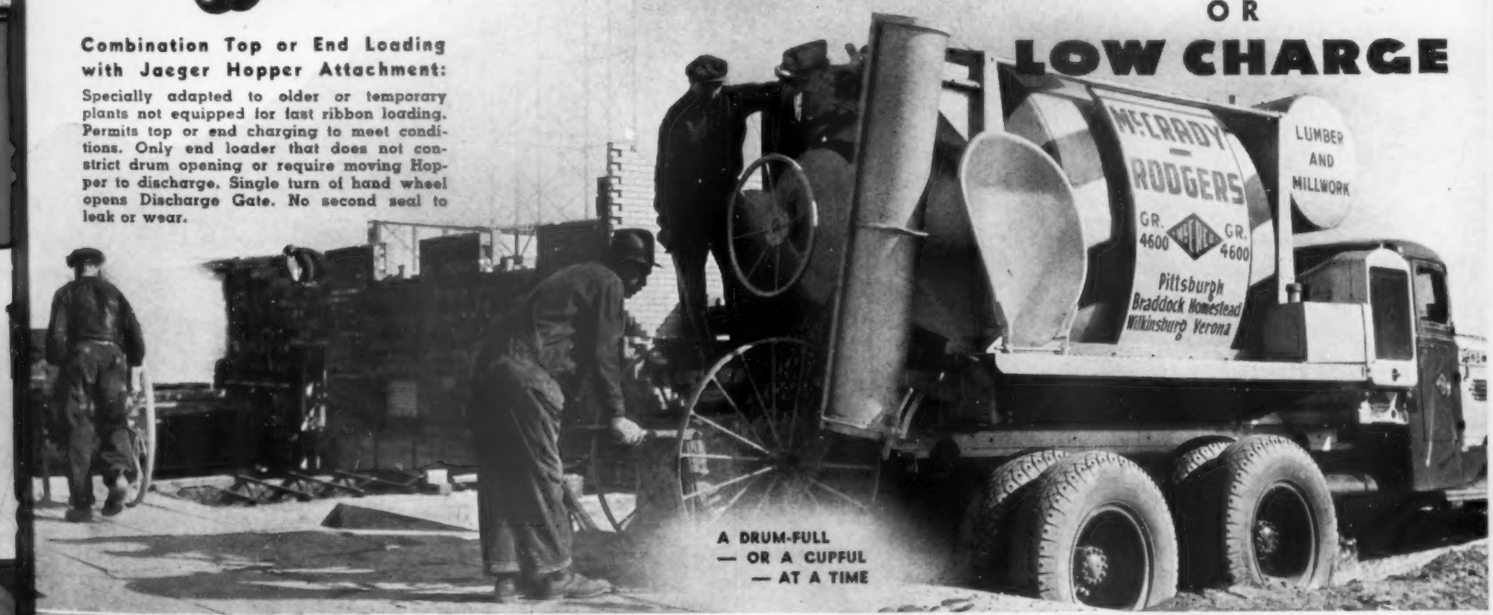
Today's concrete production is going to Jaeger Truck Mixers, Agitators as fast as operators can expand their plants: (1) because the concrete industry has proof of the *higher quality* of material produced by the Jaeger Dual-Mix Drum; (2) because opportunities for comparison, on this year's gigantic projects, have proved beyond question that Jaegers, whether HIGH DUMP or Standard LOW CHARGE, can load, mix and discharge faster than any other mixers of their type.

Jaeger, alone, offers this higher payload production with standard 2-Speed Transmission (Separate Engine or Vacuum-Controlled Truck Engine Drive), One-Shot Top Loading, Vacuum-Controlled High Discharge Door, End-to-End Water Sprays and Mixing in Sealed Drums — *in the only line that completely meets every specification and operating demand.*

Combination Top or End Loading with Jaeger Hopper Attachment:

Specially adapted to older or temporary plants not equipped for fast ribbon loading. Permits top or end charging to meet conditions. Only end loader that does not constrict drum opening or require moving Hopper to discharge. Single turn of hand wheel opens Discharge Gate. No second seal to leak or wear.

OR
LOW CHARGE



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— AT A TIME

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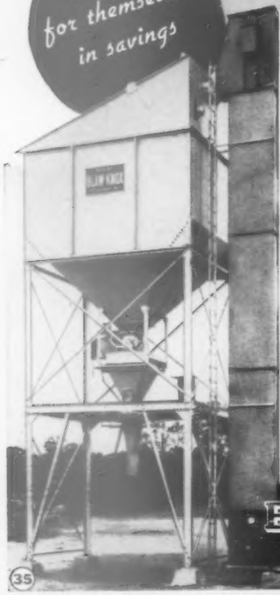
PORTABLE
BULK CEMENT PLANTS
"Have everything"

SHIPPED IMMEDIATELY FROM STOCK

They pay for themselves in savings

A complete job ready to go to work. They include:

- Cement storage bins in a complete range of capacities, both portable and knockdown type, including steel roof for the storage bin.
- Weighing batchers for cement, of any size required, equipped with either beam scales or springless dial scales—manual or automatic types.
- Conveying equipment for elevating cement into storage bins with necessary unloading equipment for receiving cement in hopper bottom cars, box cars, or from truck delivery.
- Power unit and drive for conveying equipment, either gasoline or electric.



AND ACCURATE BATCHERS

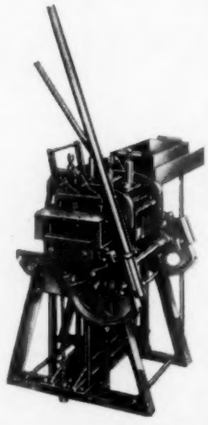
Interesting Blaw-Knox Bulk Cement Plants are fully described in Catalog No. 1566. Write for a copy.

BLAW-KNOX
BLAW-KNOX DIVISION of Blaw-Knox Co.
FARMERS BANK BLDG. PITTSBURGH, PA.

BLAW-KNOX BINS AND BATCHERS • ROAD FORMS • STREET FORMS • CONCRETE SPREADERS • TAMPING ROLLERS • VIBRATORS
CONCRETE BUCKETS • CLAMSHELL BUCKETS • TRUCK MIXERS • STRIPING MACHINES • TURNTABLES • ROAD FINISHERS • STEEL FORMS

Fully-Pressed Units at Rock-Bottom Cost

This Double Press Block Machine produces the highest types of concrete block or brick, is low in first cost, simple to operate and maintain. Hand operated—no power cost. Long levers exert powerful pressure on both top and bottom of mold. Capacity up to 4 blocks per minute. Get the facts about this money maker today!



Exclusive, protected territories assigned to responsible operators, protecting your investment and your profits.

MORTARLESS TILE MACHINE CO., Inc.
3328 San Fernando Rd.
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Miles CONCRETE EQUIPMENT

SIMPLE AS A-B-C

Miles Equipment does not require the services of an expert mechanic. Anyone without previous mechanical experience can keep a Miles machine in perfect operating condition.

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The Miles Manufacturing Company
Dept. 2, Jackson, Michigan

It is better to own a Sherman machine than to compete with one.

SHERMAN'S

Ball Bearing Concrete Pipe Machine, showing the sectional core which is the most economical core. By replacing only one section at a time which is a savings of 75% to the user.

Write for Prices and Information

SHERMAN CONCRETE PIPE CO.
KNOXVILLE, TENN.

CONCRETE FLOORS . . . YOUR BIG UNDEVELOPED MARKET

This subject was the highlight of the recent Chicago concrete convention. The new, exclusive STONEX process provides the solution. It enables products makers to fill the need, at low cost, for a finished concrete floor. Learn more about the STONEX process and the licensing plan with protected territories. Write for complete details.

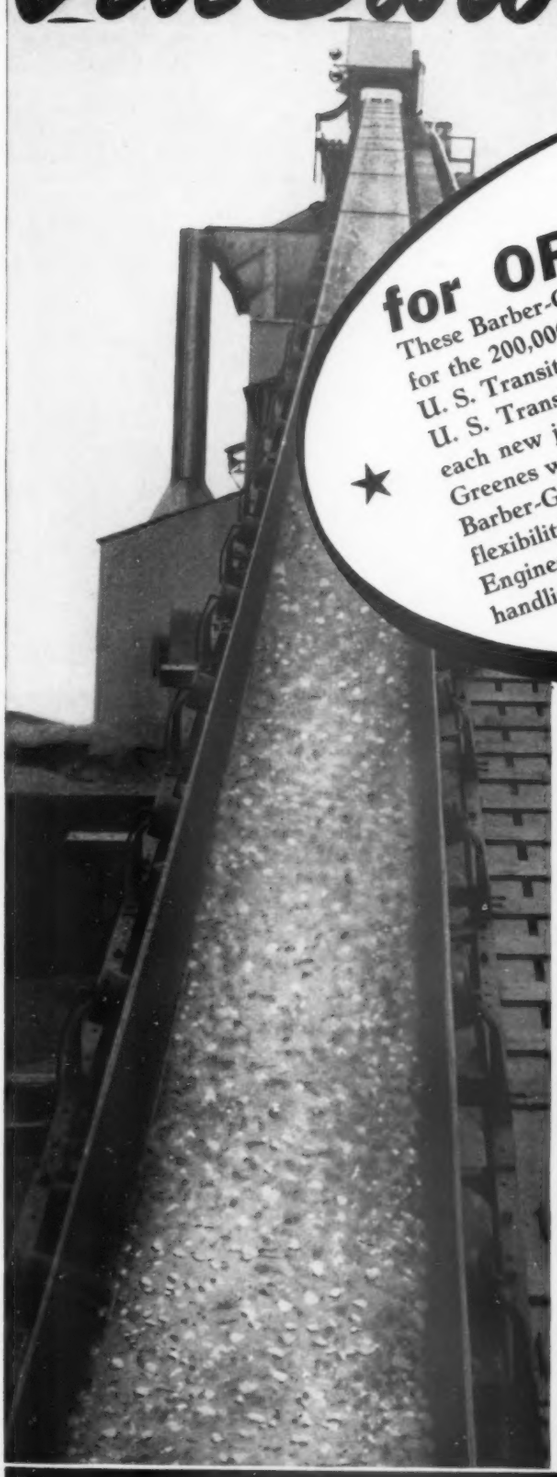
STONEX INDUSTRIES
500 N. W. 79th St. Miami, Fla.
33 N. La Salle St. Chicago, Ill.

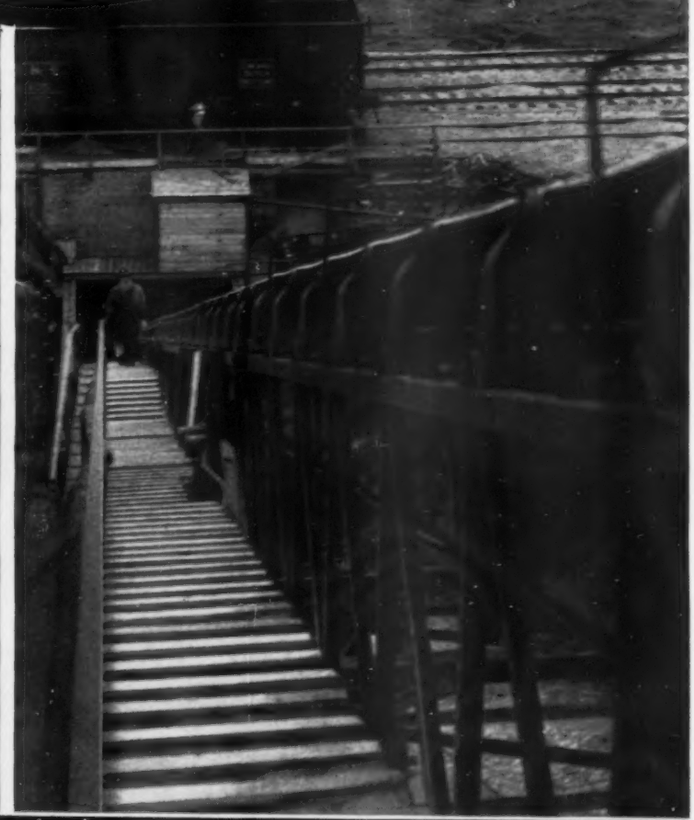
Via Barber-Greenes

for ORDNANCE Plants

These Barber-Greene Conveyors are delivering the aggregate for the 200,000 cubic yards of concrete being produced by the U. S. Transit-Mix Concrete Corporation near Wilmington, Ill. U. S. Transit-Mix is organized to move bag and baggage to each new job. They've selected the right conveyors. Barber-Greenes were designed to be easily erected, moved, or altered. Barber-Greenes were designed for contracting. The unequalled flexibility of Barber-Greenes plus the vast experience of our Engineering Department are available for your own material handling problems. Phone, wire, or write.

41-6





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STANDARDIZED MATERIAL HANDLING MACHINES

AURORA ILLINOIS

The CONCRETE MANUFACTURER

Wanted a MAN IN YOUR CITY

TO BE A MANUFACTURER IN AN ESSENTIAL INDUSTRY. Defense Work is placing a burden on the building industry. Lumber, steel and other materials are getting scarce and expensive. There is a great switch to masonry.

DUNBRIK-DUNSTONE meet today's building problems with low cost building units made from local raw materials, plentiful and low priced. **DUNBRIK-DUNSTONE** builds better buildings, yet brings permanent construction down to frame price levels.

WE WILL EQUIP YOU with exclusive line-production machinery to manufacture these modern building units at lowest cost. Equipment sold on easy payments and costs but fraction of other processes of equal capacity.

WE WILL SUPPLY YOU with new processes and formulas to manufacture these products in full range of colors, shades and textures. Multiple size units will enable your builders to effect a saving of as much as 1/3 in permanent, fire-safe industrial construction and low cost housing.

WE WILL GRANT YOU manufacturing franchise covering your locality, protecting your market, business and future. We will supply you complete engineering and advertising service for rapid expansion of your business.

YOUR EARNING POWER AND FUTURE. Present manufacturers have paved the way for you. Starting with limited capital they have proved the proposition for you with hundreds of millions of dollars worth of sales for Government, municipal and private construction.

YOU SHOULD INVESTIGATE this exceptional opportunity while your territory is still open. Fill in and return coupon today. No obligation.

W. E. Dunn Mfg. Co.,
420 W. 24th St.,
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Show me through your free books how I can own an exclusive DUNBRIK-DUNSTONE plant in my territory and help today's big need of better building for less.

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QUINN PIPE FORMS

HEAVY DUTY PIPE FORMS

Our Heavy Duty type with Adjustable Locks is shown above. Quinn Heavy Duty Forms are also available with a new wedge-type lock.

HAND or WET PROCESS

Make concrete pipe on the job with Quinn Pipe Forms. They can be handled by less experienced labor and produce uniform concrete pipe of highest quality. Quinn Pipe Forms make pipe conforming to A. S. T. M. requirements as to wall thickness and other standards.

Quinn Heavy Duty Pipe Forms are built to give more years of service — sizes for any diameter pipe from 12 to 84 inches — tongue and groove or bell end pipe — any length. Backed by over 30 years of service in the hands of contractors, municipal departments and pipe manufacturers.

MEDIUM DUTY PIPE FORMS

Meet the demand for low cost equipment that produces a uniform quality of pipe in smaller amounts. For making pipe 12 to 60 inches in diameter —any length.

WRITE TODAY

Get complete information on prices and Special Construction Features of Quinn Pipe Forms. Give us size of job for estimate on your pipe form needs. Also manufacturers of Quinn Concrete Pipe Machines for making pipe by machine process.

QUINN WIRE & IRON WORKS 1627 12th ST. BOONE, IA.

SAUERMAN
Long Range
MACHINES

YOU can handle any pit or bank excavation, stripping, stockpiling and reclaiming at lowest possible cost with a SAUERMAN Drag Scraper or Slackline Cableway and at the same time you simplify your operation and management problems.

Below is shown a SAUERMAN Slackline Cableway moving gravel from a pit 110 ft. deep to the top of screening plant at a rate of 90 cu. yd. per hour and at a cost of less than 5c per yard.

This is just one of the many plants, both large and small, where SAUERMAN Machines are making exceptional profits for their operators by digging, hauling and dumping in a straight line operation controlled by one man.

SAUERMAN BROS. Inc. 434 S. Clinton St. Chicago, U. S. A.

Scrapers and Cableways Since 1909

Write for Catalog and Advice on Your Problems!

"IN THE ARMY NOW!"

This "BUTLER-BUILT" concrete batching plant is doing a big supply job on the Elwood-Kankakee ordnance project. The installation can produce more than 200 cubic yards of concrete per hour.

BUTLER BINS

are servicing

MUNITIONS PLANTS

To help meet national defense needs, the Elwood shell-loading plant and the Kankakee TNT plant are being rushed to completion. These adjoining projects, located within 50 miles of Chicago, occupy 50,000 acres and will cost $70,000,000.

The single concrete batching plant supplying all the construction requirements of both projects was "Built by BUTLER."

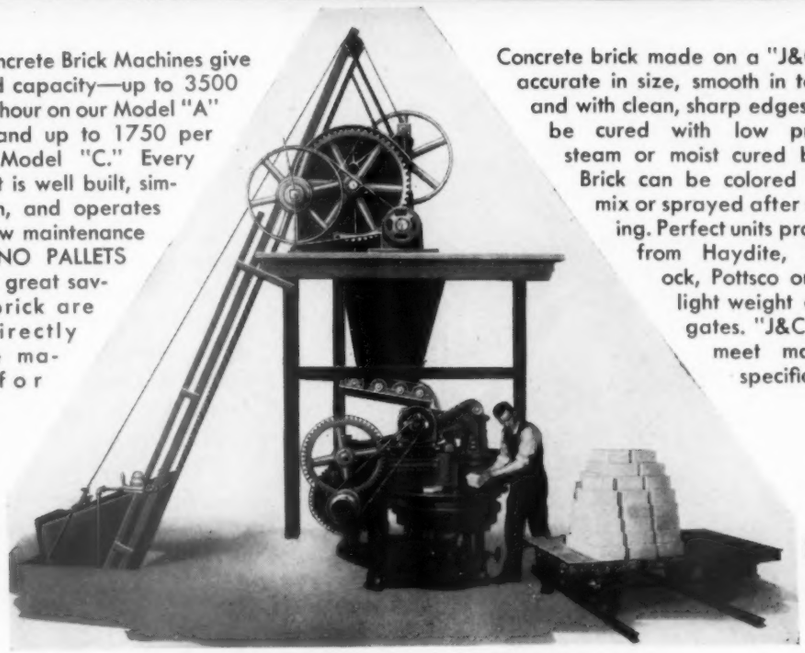
Whether the emergency is national or industrial, BUTLER engineers are qualified to design and install a concrete plant fully equipped to satisfy any production needs.

BUTLER BIN COMPANY

Waukesha, Wis.

"J&C" Concrete Brick Machines give you record capacity—up to 3500 bricks per hour on our Model "A" machine, and up to 1750 per hour on Model "C." Every "J&C" unit is well built, simple to run, and operates on very low maintenance charges. NO PALLETS used — a great saving, as brick are taken directly from the machine for stacking.

Concrete brick made on a "J&C" are accurate in size, smooth in texture, and with clean, sharp edges. May be cured with low pressure steam or moist cured by air. Brick can be colored in the mix or sprayed after moulding. Perfect units produced from Haydite, Superock, Pottsco or other light weight aggregates. "J&C" brick meet maximum specifications.



Write for Profit Data

Since 1881

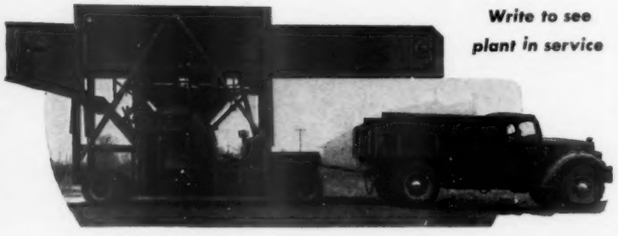
Model "C" Brick Machine, skip and car

JACKSON & CHURCH CO.

SAGINAW, MICH.

3 YEARS OF SERVICE OVER U. S. A. 3 SIZES OF STRAYER CONCRETE PORTABLE PLANTS

are moving from job to job, 300 yds. here, 11,000 yds. there, making concrete to specifications under all conditions over all kinds of roads. This extra arm extends Central Plant operation, frees truck-mixers for short, profitable hauls. Consider carefully the addition of a Strayer Portable Concrete Plant *now* to meet concrete demands—deliveries are being made on schedule. Get the facts on the time-tested Strayer Plant today.



Write to see plant in service

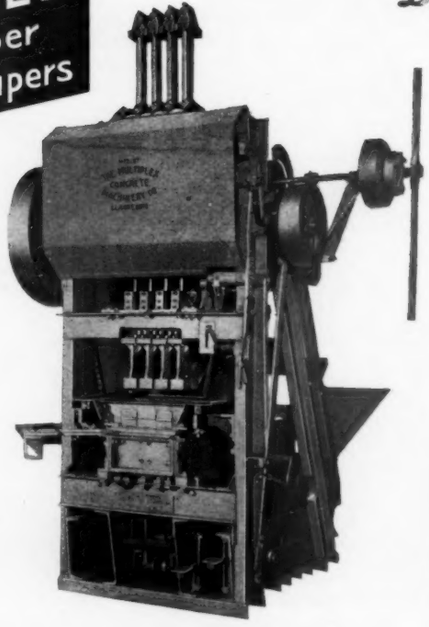
CLEARANCE IN TRANSIT - - - 8 FT. WIDE - - - 12'-6" HIGH - - - 3 SIZES - ½ - ¾ - 1 YD.

ERIE STEEL CONSTRUCTION CO. • ERIE, PA.

A NEW HIGH IN QUALITY CONCRETE BLOCK PRODUCTION

MULTIPLEX Super Tamper with 8-Bar Tampers

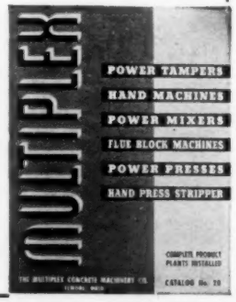
Your "Secret Weapon" for Bringing Down Production Costs



- Runs quietly with little vibration.
- Has position-timed feeding and stripping—quick action 5-point clutches.
- Handles all kinds of aggregates with a wetter mix.
- Turns out 4 to 6 units per minute—no waiting time.

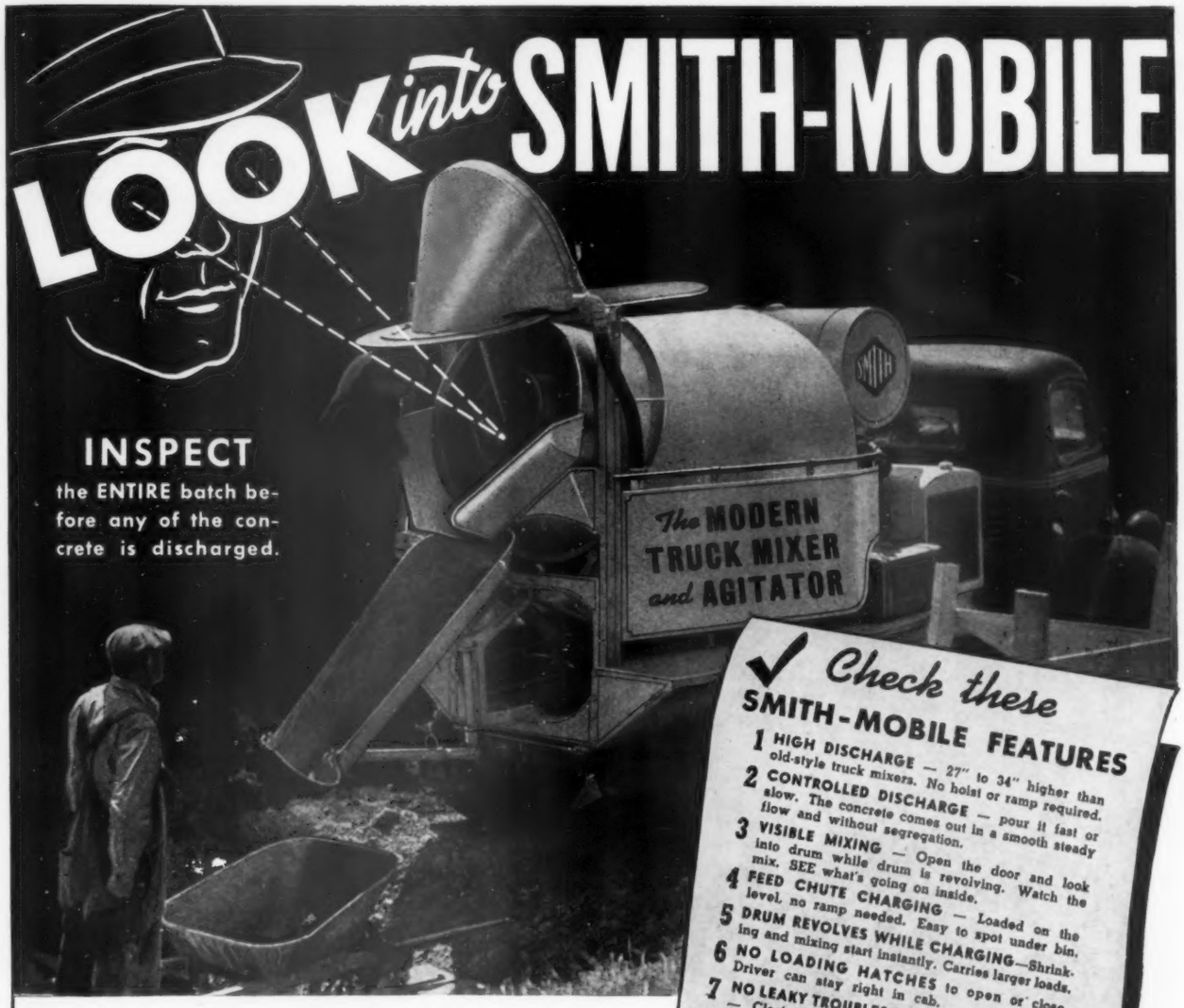
Concrete-block producers everywhere are finding that our 8-Bar Super Tamper attacks operating costs and *brings them down.* This sturdy, extra-heavy machine with split bar front and rear tamping and patented feet permits the use of a wetter mix with fewer tamps. Counter balance cam-shaft eliminates vibration. Automatic and positive pusher type feeder; no delay between operations. Capacity 250 to 350 perfectly-formed blocks per hour in all standard sizes and faces.

Send for our Catalog, with full information about MULTIPLEX money-making equipment, including the Multi-Mixer for faster and more thorough mixing of any concrete batch.



The *Multiplex* CONCRETE MACHINERY CO., ELMORE, O.

LOOK into SMITH-MOBILE



REAL VISIBLE MIXING

. . . an Exclusive Smith-Mobile Feature

Enables the contractor, inspector or foreman to control the batch, make sure that the concrete is just the way he wants it—not too wet, not too dry, etc. At any stage of the mixing cycle (even with a full load), the door can be opened wide, and no concrete will come out until the drum is reversed. You can look right into the drum and actually SEE what's going on inside. Remember, Smith-Mobile is the ONLY truck-mixer that gives you this important feature. So, be sure to look into the PROFIT possibilities of this modern, high-discharge truck mixer. All standard sizes available, as truck mixers or as agitators. Write for catalog 198-A.

THE T. L. SMITH COMPANY
2887 N. 32nd Street Milwaukee, Wis., U.S.A.

✓ Check these SMITH-MOBILE FEATURES

1 **HIGH DISCHARGE** — 27" to 34" higher than old-style truck mixers. No hoist or ramp required.

2 **CONTROLLED DISCHARGE** — pour it fast or slow. The concrete comes out in a smooth steady flow and without segregation.

3 **VISIBLE MIXING** — Open the door and look into drum while drum is revolving. Watch the mix. SEE what's going on inside.

4 **FEED CHUTE CHARGING** — Loaded on the level, no ramp needed. Easy to spot under bin.

5 **DRUM REVOLVES WHILE CHARGING**—Shrinking and mixing start instantly. Carries larger loads.

6 **NO LOADING HATCHES** to open or close. Driver can stay right in cab.

7 **NO LEAKY TROUBLESOME DISCHARGE DOOR** — Closing door on Smith-Mobile can be kept open during mixing cycle.

8 **WATER INTRODUCED THROUGH CHARGING OPENING**—for transit mixing, water nozzle located in top part of drum, well above concrete. High pressure pump furnished as regular equipment.

9 **STEEP DISTRIBUTING CHUTE FOR DRY CONCRETE** — Will spout dry concrete directly into high forms, buckets, concrete carts, etc., without pushing it down the chute.

10 **LARGER RADIUS OF SPOUT DISTRIBUTION**— Use the spout for pouring directly into forms instead of using carts or wheelbarrows.

11 **BETTER AND FASTER MIXING** — Scientifically designed T-shaped spiral blades provide a fast end-to-end movement of the aggregates.

Look into its History

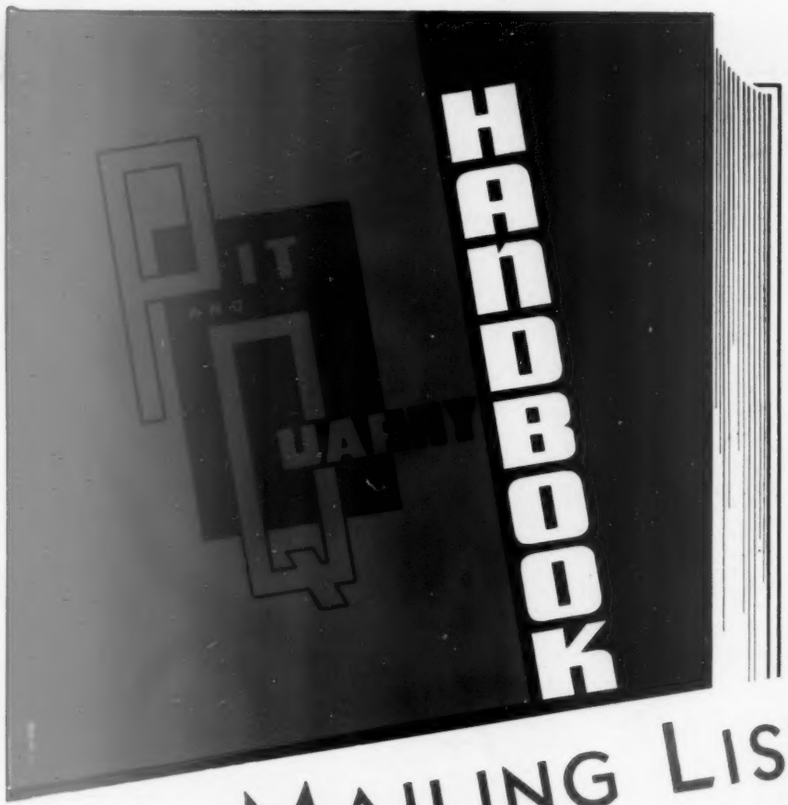
Smith-Mobile is the ORIGINAL high-discharge truck mixer backed by 10 years of experience designing and perfecting high discharge truck mixers and more than 40 years' specialized experience manufacturing concrete mixers of every size and description. Hundreds of Smith-Mobiles are now in successful operation. So, why gamble with new and untried machines? Play safe! Buy SMITH-MOBILE!

SMITH

CONCRETE MIXER MANUFACTURERS SINCE 1900

A 3405-1P

The CONCRETE MANUFACTURER



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- **Hundreds of new names; others checked and revised.**
- **Alphabetical by companies; geographical by plants.**
- **Consolidated catalogs of equipment makers.**
- **Revised and improved technical section.**

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The compilers of the 1941 Directory Section of Pit and Quarry Handbook have labored painstakingly to build an accurate list of all known American producers of nonmetallic minerals. Each new listing has been carefully scrutinized for accuracy and completeness. Previous listings have been revised, checked, double-checked. All appear two ways—(1) alphabetical by companies, (2) geographical by plants. It gives you company names, officers, location of plants, size or capacity, and names of the men who do the buying. Select the complete Handbook and Directory, or the convenient, flexibly-bound Directory alone. Now ready for distribution. Order NOW to insure getting one of the first copies. Use coupon below . . . we'll bill you after you get the book.

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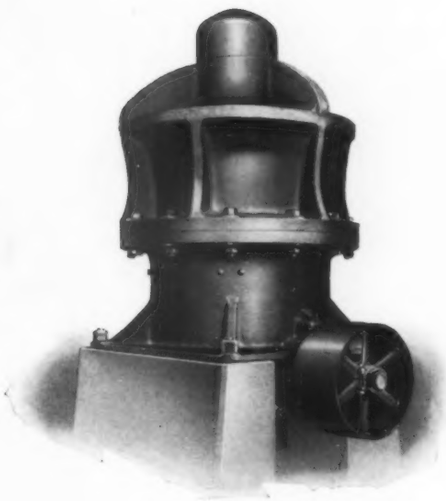
TY REDUCTION CRUSHER

The famous Traylor Type TY Reduction Crusher is popular because it has made extra dollars for hundreds of users, who are so friendly to it that they recommend it to other operators. Those extra dollars and friendships arise from the two outstanding characteristics of the "TY"—its high efficiency, and its absolute dependability to maintain that efficiency.

It is the ahead-of-the-procession design of the machine, of course, that must be credited with the crusher's efficiency and dependability—all of the strength that is needed, and to spare, simplicity of construction, scientific lubrication, positive protection against the entrance of dirt and grit into the wearing parts, and against damage by tramp iron, and non-chokability that achieves maximum production.

Our representative has facts and figures galore that are sure to be of interest to prospective users and our new Bulletin 3112 contains full details. See them both—they are available at any time. Write us today!



INVESTIGATE OUR TYPE H BLAKE CRUSHER (BULLETIN 1105), AND OUR MULTI-STAGE FINE REDUCTION CRUSHER—(BULLETIN 113).

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• Powerful in biting and gripping, fast in action, and ruggedly built, Williams Buckets are in a class by themselves for digging power and hard service.

Williams Buckets and Parts are carried by distributors in all parts of the country. Bulletins covering Williams Power Arm, Multiple Rope, and Dragline Buckets sent on request.

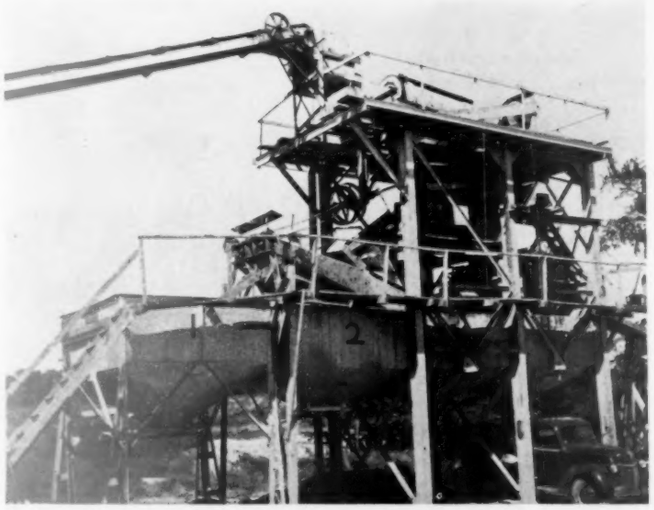
THE WELLMAN ENGINEERING CO.

7014 CENTRAL AVE. • CLEVELAND, OHIO

WILLIAMS *Buckets*

built by WELLMAN

EAGLE *Gets the Job...*



Two EAGLE Spiral Screw Washers in the Paul Concrete Material Co. Installation.

. . . . on the merit of EAGLE performance. The Paul Concrete Material Company, of Fort Dodge, Iowa, conducts one of the best-known sand and gravel operations in the state. It is a 40-ton per hour semi-portable plant, and supplies concrete for widely ranging construction jobs. Two EAGLE Washers and Dewaterers insure a first-class product that meets all commercial and highway specifications.

EAGLE Equipment is the first choice of Sand and Gravel producers who demand *high-capacity, high-profit* machines that consistently furnish high-quality material.

The commanding performance of EAGLE Washers is common knowledge throughout the industry, and is directly due to exclusive and fully protected features. EAGLE design and construction are responsible for the proverb: "Good Cement always requires Clean Aggregate—and EAGLE'S assure *both*."

Write for our new Bulletin No. 41

EAGLE Products include: EAGLE Shale Planer, EAGLE Dry and Wet Pans, EAGLE Grinder, EAGLE Washers, EAGLE Swintek Screen Nozzle Ladders, EAGLE Roll Crushers.

EAGLE IRON WORKS
DES MOINES - IOWA

Readers' Service Department
PIT and QUARRY

538 South Clark St., Chicago, Ill.

Please send me information concerning the items checked below:

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- ☐ Air-compressors
- ☐ Air-filters
- ☐ Air-separators
- ☐ Asphalt-mixing Plants
- ☐ Bag-filling and Bag-weighing Machinery
- ☐ Bags, Cloth
- ☐ Ball-mills
- ☐ Balls (Steel)
- ☐ Bearings (Anti-friction)
- ☐ Belt-conveyors
- ☐ Belting (Conveyor, Elevator, Transmission)
- ☐ Bin Gates and Chutes
- ☐ Bin Indicators
- ☐ Bins (Steel)
- ☐ Bitumen Heaters
- ☐ Bodies (Demountable Truck)
- ☐ Bodies (Heavy-duty Dump-truck)
- ☐ Bucket Elevators
- ☐ Buckets (Clam-shell)
- ☐ Buckets (Conveyor and Elevator)
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- ☐ Bulldozers
- ☐ Cable (Electric)
- ☐ Cars (Dump)
- ☐ Cars (Kiln)
- ☐ Cement Plants (Complete)
- ☐ Chains (Transmission)
- ☐ Classifiers
- ☐ Coal-pulverizing Equipment
- ☐ Concentrating Tables
- ☐ Concrete-block Machinery
- ☐ Concrete-brick Machinery
- ☐ Concrete-mixing Plants (Complete)
- ☐ Concrete-pipe Machinery
- ☐ Concrete-products Plant Equipment
- ☐ Cones (Washing)
- ☐ Conveyors (Apron)
- ☐ Conveyors (Belt)
- ☐ Conveyors (Pneumatic)
- ☐ Conveyors (Screw)
- ☐ Conveyors (Vibrating)
- ☐ Coolers (Clinker)
- ☐ Couplings (Flexible)
- ☐ Cranes
- ☐ Cranes (Tractor)
- ☐ Crushed-stone Plants (Complete)
- ☐ Crushers (Cone)
- ☐ Crushers (Gyratory)
- ☐ Crushers (Hammer)
- ☐ Crushers (Jaw)
- ☐ Crushers (Ring)
- ☐ Crushers (Roll)
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- ☐ Dewatering Equipment
- ☐ Disintegrators
- ☐ Drag-line Scrapers
- ☐ Drag-lines (Cableway)
- ☐ Drag-scrapers (Power)
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- ☐ Drills (Blast-hole)
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- ☐ Drills (Wagon)
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- ☐ Elevators (Bucket)
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- ☐ Engines (Gasoline)
- ☐ Excavators (Cableway)
- ☐ Explosives
- ☐ Feeders
- ☐ Feeders (Automatic, Proportioning, Regulating, Weighing)
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- ☐ Flotation Machinery
- ☐ Frogs and Switches
- ☐ Gear-motors
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- ☐ Generator Sets (Engine)
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- ☐ Grinding Balls
- ☐ Grizzlies
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- ☐ Hammer-mills
- ☐ Hoists (Drum)
- ☐ Hoists (Skip)
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- ☐ Hydrators
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- ☐ Industrial Trucks
- ☐ Kettles (Calcining)
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- ☐ Kilns (Vertical)
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- ☐ Power Units (Internal-combustion)
- ☐ Pulleys (Power-transmission)
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- ☐ Pulverizers (Hammer)
- ☐ Pulverizers (Ring)
- ☐ Pumps (Centrifugal)
- ☐ Pumps (Deep-well)
- ☐ Pumps (Dredging)
- ☐ Pumps (Pulverized-material)
- ☐ Pumps (Slurry)
- ☐ Pyrometers
- ☐ Racks (Curing)
- ☐ Ready-mixed-concrete Plants
- ☐ Recorders (Pressure and Temperature)
- ☐ Recuperators
- ☐ Refactories
- ☐ Roofing and Siding
- ☐ Rope (Manila)
- ☐ Sand-and-gravel Plants (Complete)
- ☐ Sand-drags
- ☐ Sand-lime-brick Machinery
- ☐ Scales (Conveyor)
- ☐ Scales (Hopper)
- ☐ Scales (Motor-truck)
- ☐ Scales (Track)
- ☐ Scrapers (Self-loading)
- ☐ Screens (Laboratory)
- ☐ Screens (Revolving)
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- ☐ Thickeners
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- ☐ Transformers
- ☐ Transmissions (Variable-speed)
- ☐ Trippers (Belt)
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- ☐ Trucks (Tractor)
- ☐ Tube-mills
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- ☐ Vibrators (Concrete)
- ☐ Wagons (Dump)
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This is to be used for producing.....

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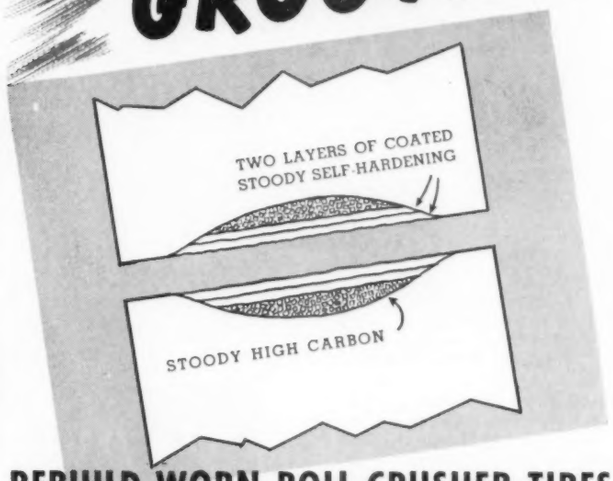

REBUILD WORN ROLL CRUSHER TIRES WITH COATED STOODY SELF-HARDENING

★ When your roll crushers develop circumferential grooves, we suggest partially filling in the low spots with Stoody High Carbon and finishing off with a layer or two of ¼x14" Coated Stoody Self-Hardening. Because Stoody Self-Hardening deposits are much more wear-resistant than either manganese or high carbon steel, they reduce localized wear and permit the rolls to wear more uniformly.

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Stoody Self-Hardening and other Stoody hard-facing rods are carried in stock by the Stoody distributors listed below.

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Manufacturers of Tungsten Bonod, Stoodite, Stoody Self-Hardening and other Hard Facing Metals

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A Manganese Steel Replacement Designed for Extra Long Rim Life

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Speed up your material handling with a new Industrial Brownhoist clamshell bucket. All standard types ready for immediate shipment (photo shows a small part of our large stock). Quantity production plus our manufacturer-direct-to-you sales policy lowers your bucket investment. Write today.

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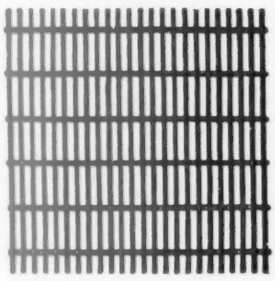

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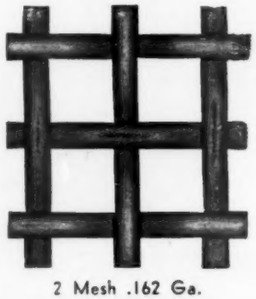
Available in Square Mesh and Rolled Slot. A trial will convince you of the superiority.



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THE CLEVELAND WIRE CLOTH & MFG. COMPANY
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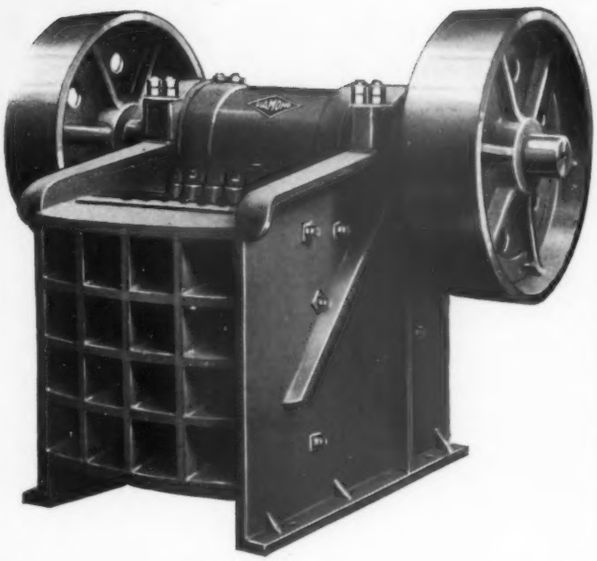

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DIAMOND long jaw design is responsible for high, uninterrupted production and unfailing uniformity. A highly efficient face contour assures positive grip and crushing effect on the upper or feed end of the jaws. This curve at the lower or discharge end of the movable jaw creates a parallel action of the stationary jaw and produces a uniform product.

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Will gladly help you work out in the most economical manner any crushing, screening and conveying problems that may confront you. Their skilled service is at your command, and we will welcome your inquiry and give it immediate attention. No obligation, of course.

JAW CRUSHERS
ROLL CRUSHERS
VIBRATING SCREENS
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Marvels of flexibility, high efficiency and economical operation, DIAMOND portable plants are built in a wide range of sizes and capacities. DIAMOND plants embody many exclusive and patented features, all making for easy portability, fast, uninterrupted, low cost operation and long years of dependable service.

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ASK for bulletins covering any items of interest. They will be sent promptly. And remember, our engineers will gladly offer their suggestions.

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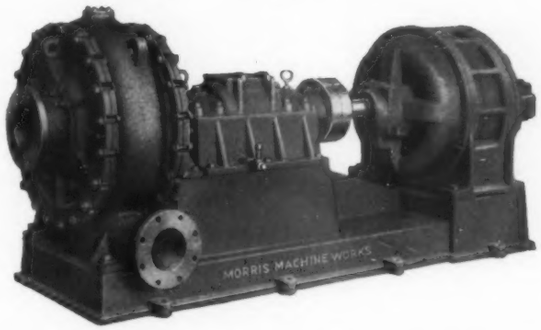

For authoritative recommendations on any pumping or dredging problem, write to Morris Machine Works, Baldwinsville, N. Y. Representatives in principal cities.
Export Office: 50 Church St., New York City.

DEFENSE *Against* WEAR

Save wear on your hammers by protecting them with Coast Metals. This photograph shows a hammer surfaced with Coast Metal No. 112, after 155 hours service pulverizing glass cullet in a test against five competitive hard-surfacing materials, three of which were worn beyond effective operation after 28 hours. The other two lasted 8 and 14 hours.

This is a typical example of Coast Metals toughness under combined impact and abrasion. Write to us for advice on your pulverizing problems and we will recommend the right rod for your particular case. Several types of Coast Metals, Nos. 101, 104, 107, 112 and 113 are excellent for coating hammers. The selection of the proper type depends on various factors, such as analysis of the base metal, the material handled and the degree of abrasion and impact.

Coast Metals are giving exceptional service crushing such abrasive materials as limestone, shale, clay, glass, metal turnings, coal, quartz and silica rock.

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HYDRATORS & HYDRATE PLANTS

Production and profits in lime and hydrate plants just naturally zoom to a new "ceiling" when you install the York-Kuntz patented kiln.

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LIME & HYDRATE PLANTS CO.

YORK PENNSYLVANIA

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for *Extra* belt lacing hours

One of our lunch hour statisticians estimates that two hundred million belts have been laced with Alligator steel belt lacing since its introduction thirty years ago.

If these belts could all tell their story of performance it would be summed up in "*extra* belt lacing hours."

Since the original patent expired there have been many lacings that looked like Alligator. But fortunately for Alligator the making of belt lacing is a highly specialized job. Years of research, backed by thousands of dynamometer tests plus better alloy steels and the constant improvement in die making and stamping practice, have been responsible for these *extra* belt lacing hours.

Every plant should have a supply of Alligator steel belt lacing on hand. Twelve sizes for flat belts of all types up to 5/8" thick. Special lengths for wide belts. Also made in "Monel" and "Everdur." Order from your supply house.

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15 EDITIONS and still going strong

● Here is a 72-page pocket size manual, "Short Cuts to Power Transmission," that presents a wealth of practical information about transmission and conveyor belts. Offers pointers on how to care for belts, methods of lacing, how to repair conveyor belts, etc.

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STEEL BELT LACING

FOR ECONOMY-MINDED TRAVELERS

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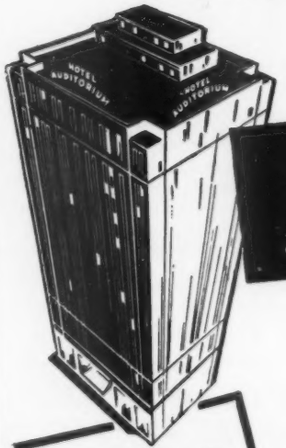

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THE OSGOOD COMPANY
MARION, OHIO

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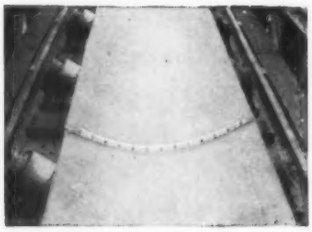
FOR CONVEYOR ELEVATOR AND TRANSMISSION BELTING



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FINISH THE JOB

WITH A

BAUGHMAN LIMESTONE SPREADER

Be sure that your production of agricultural limestone is correctly applied. Baughman spreaders will do it. Even distribution of limestone up to 40 ft. width is assured by the spreading action of a specially-designed revolving disc.

The illustration below shows two 7½ ton Baughman MAMMOTH limestone spreaders at work. Notice how the spread is held down to the ground where it belongs and also the width of the spreads. These two machines have spread thousands of tons of lime and are still going strong.

Baughman limestone spreaders are made in models that can be attached to flat or dump trucks. The new, improved MAMMOTH carrier and spreader comes in seven models ranging from 6 to 18 tons. Each model is a self-contained unit with built-in drives and controls.

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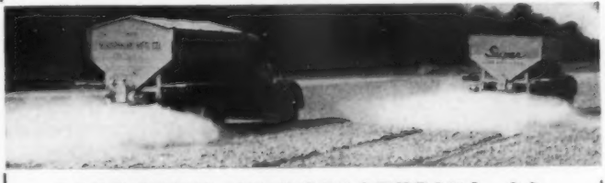

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Specializing in Spreading Equipment
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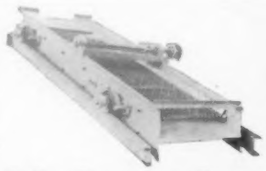

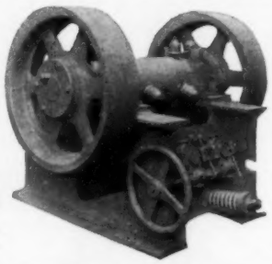

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Single and double roll and jaw crushers, hammer mills, super dry pans, — steel log washers and scrubbers, sand drags, revolving and vibrating screens, elevators, conveyors, dryers, jigs, hoists, — complete portable, semi-portable and stationary crushing, screening and washing plants for different capacities of any materials.

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for cement, lime, ores, etc.

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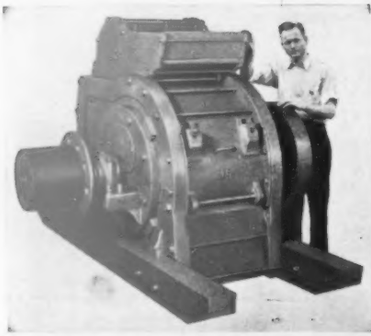

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Crushing Range of DAY Swing Hammer Pulverizers

...makes one machine serve the purpose of two or more other types of crushers. The toughest crushing jobs are "All in a DAY'S work."

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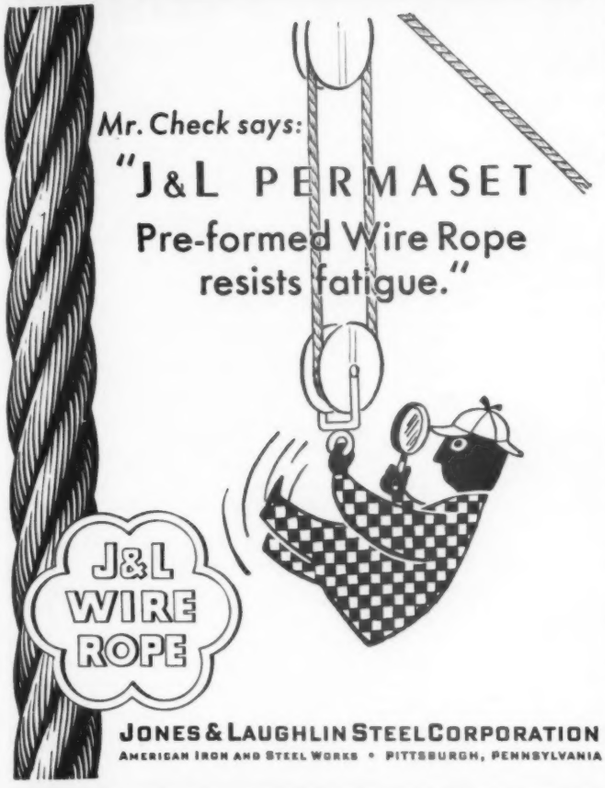

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Pre-formed Wire Rope
resists fatigue."

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AMERICAN IRON AND STEEL WORKS • PITTSBURGH, PENNSYLVANIA

Kue-Ken Crusher sets a record;
43,000 Tons Crushed with a single set of Jaw Plates

Previous crusher on the job needed new jaw plates after crushing only 9000 tons of the same rock.

Five times longer jaw plate life means lower costs . . . fewer shut downs for changing plates. And that isn't all you get with a Kue-Ken Balanced Crusher on the job . . . you save four additional ways: (1) *Save Crushing Time*—one owner crushes six carloads of rock in the same time required previous crusher to crush a single carload of the same rock. (2) *Save on Investment*—Kue-Ken weighs less, costs less to transport, and crushes finer at a single pass . . . (3) *Save on Power*—Balanced, almost completely vibrationless, mechanism runs in cool oil bath, means less power required and practically 100% conversion of power to actual crushing. (4) *Save on Installation Cost*—Elimination of vibration makes heavy foundation unnecessary. You can mount the Kue-Ken on a truck bed, tall bins or head frames. Many are in operction while mounted to light skid frames.

Case histories prove all these claims. Get complete details immediately . . . there's no cost or obligation. Ask for bulletin No. 601.

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Every AMERICAN Crusher, Hammermill and Ringmill is ruggedly built, assuring long troublefree service. High-test cast iron, special steels and long-wearing abrasion-resisting manganese steel are combined to provide a quality reduction machine. Capacities from 10 to 100 tons per hour.

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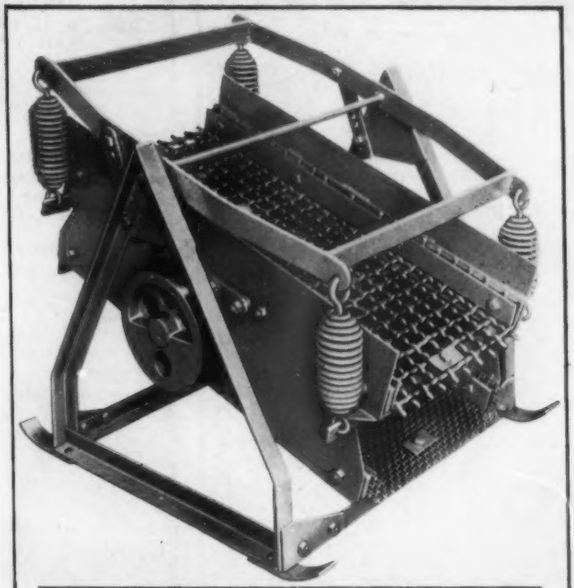

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ACCURATELY SEPARATES 100 TONS OF MATERIAL PER DAY INTO 3 PRODUCTS
USES ONLY A 1 H.P. ELECTRIC MOTOR OR 2 H.P. GAS ENGINE
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FOR SALE
LOCOMOTIVE CRANES

1—55-ton O. & S. New 1926. 60 ft. Boom. Air brakes.

1—40-ton Brownhoist. New 1921. 50 ft. Boom.

1—40-ton O. & S. New 1926. 60 ft. Boom.

2—20-ton McMyler. 50 ft. Booms. New 1925.

All the above are steam operated, mounted on 8-wheel MCB trucks and suitable for transportation on their own wheels.

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Rebuilt Equipment

BALDWIN 58 ton 6 wheel switcher, 19x24" cyl. Walscheart valve gear.
DAVENPORT 22 ton 4-wheel Saddle Tank; Cyl. 11x16.
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PLYMOUTH 12 Ton 36" Ga. Gasoline Locomotive; Hand Brakes.
BROWNHOIST Model 4, 20 Ton 8-Wheel Locomotive Crane.
3 PLYMOUTH Model FL, 24" Ga. Gasoline Locomotive.
1 WHITCOMB Model CS-4, 4½ Ton, 24" Gauge Gasoline Locomotive.
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Plant & General Offices
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FOR SALE
THREE PRACTICALLY NEW ELECTRIC MOTORS

1—General Electric squirrel cage induction motor—440 volt—3 phase—60 cycle—100 H.P.—1050 ft. lb. pull-out torque—123 amp.—900 R.P.M. synchronous speed—their type FT—Frame No. 556—Model No. 85E197GI—Serial No. 5390921.

1—Westinghouse squirrel cage induction motor—440 volt—3 phase—60 cycle—125 H.P.—1350 ft. lb. pull-out torque—160 Amp.—900 R.P.M. synchronous speed—their Type "CS" Special No. 56N475—Frame No. 774C—Serial No. 1S56N475.

1—General Electric squirrel cage induction motor—2200 volt—8 pole—3 phase—60 cycle—100 H.P. at 900 R.P.M.—1050 ft. lb. their Type FT—frame 556—serial No. 5314496—maximum pull-out torque—full load current at 220 volts—26.5 amperes—direction of rotation counter-clockwise looking from shaft end. Bearing end thrust 750 lb. away from motor at shaft end.

1—Oil circuit breaker—General Electric Type FK 20—Cat. No. 6070395G29—rated 2500 volts with double series inverse time delay overload trip—single throw and triple pole series coil rated 50 amperes—equipped with instantaneous under voltage device.

All three motors are ball bearing equipped and will take a limited amount of end thrust. The stub end of the motor, to which a pinion or pulley can be applied, is 3.875 diameter, tapered for a distance of 4⅛". The taper is 1¼" per foot. The keyway is ⅞" x ⅝". The extreme end of the shaft is threaded to take an SKF nut and lock washer to hold the pinion or pulley on the tapered stub end.

If interested write

Lima Locomotive Works, Incorporated
Shovel and Crane Division
Lima, Ohio

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225 tons, 4 compt. bin, weigh batcher.
Butler 100 yd. 3 compt. bin, weigh batcher.
2—115 tons Johnson bins, 2 compt.
Steel bin, 75 yds., single compt., sand and gravel.
Beaumont 42 yd. two compt. bin.
200 ton rock storage bin, steel, heavy construction.
Fuller Kinyon bulk cement unloader, portable.
Fuller C40 rotary air compressor, electric.
Smith 1 yd. tilting mixer, electric.
Ransome 1 yd. mixer, electric, practically new.
Koehring 27-E paver with boom and bucket.

BUCKETS—STONE SKIPS

22—Steel stone skips. 2 to 3 yds.
1½ yd. heavy duty Blaw-Knox digging bucket.
1½ yd. Hayward rehandling clamshell.
1¼ yd. heavy duty Blaw Knox, digging, clamshell.
1 yd. Hayward clamshell, rehandling.
¾ yd. Haiss rehandling, clamshell.
1 yd Hayward orange peel, 4 leaf.
¾ yd. Hayward orange peel, 3 leaf.

SHOVELS—CRANES

2—Marion Diesel shovels, 1¾ yd. cap.
No. 50 Bucyrus Erie steam shovel, 2 yds. cap.
No. 50-B Bucyrus-Erie electric shovel, 2 yds.
Lima 750 1¾ yd. gas crane, 70' boom.
Northwest 1½ yd. gas crane, 60' boom.
Bucyrus Erie electric tunnel shovel, 1 yd. cap.
Northwest 1 yd. comb. shovel-crane, gas.
Brownhoist 10 ton crane, gas, 40 ft. boom.

TRACTORS

RD-8 Caterpillar, with bulldozer.
RD-7 Caterpillar, with bulldozer.
Allis-Chalmers Model 35, with bulldozer.
Caterpillar Model 30, with L.P. bulldozer.

LOCOMOTIVES—CARS

2—Vulcan 6 ton, gas, 36" gauge.
2—Whitcomb 4½ ton, gas, standard gauge.
8—3 yd. V type 36" ga. side dump cars.

CRUSHERS—PLANT

Gyratory crushers: K.V.S. 30, 37-S, 49; Telsmith 32, 8A, 8B; Traylor 8"; McCully 13", 8", 6".
Jaw; 6x12, 9x16, 10x20, 12x26, 13x30, 15x30, 16x32, 36x48, 48x60.
Complete portable rock crushing plant, nearly new, with crusher, elevator, screen, etc.

RICHARD P. WALSH CO.
30 Church St. New York, N. Y.

FOR SALE
AIR COMPRESSORS

3—I-R POC-2 Diesel Compressors, 603 CFM, 125 lbs.
2—C-P Vert. Du. Compressors, 693 CFM, 125 lbs.
1—Sullivan WJ-3 Compressor, 1300 CFM, 125 lbs.
1—Sullivan WJ-3 Compressor, 800 CFM, 125 lbs.
1—Gen. Elec. Centrifugal Compressor type FSB 2400 CFM at 2.69 lbs. with Dir. Con. Motor.

Brooklyn Contractors Machinery Exchange, Inc.
1415 Bergen St., Brooklyn, N. Y. President 3-7778

FOR SALE

Koehring shovel attachment for Model 501, high lift, dipper 1¼ yd., first class condition. Low price for quick sale.

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CONVEYOR BELTING FOR SALE

42" wide Heavy Duty Conv. 130 ft.
36" wide Heavy Duty Conv. 175 ft.
12" wide Gyratory Crusher Belt, 8 PLY, 105 ft.
12" wide, BUCKET ELV. BELT, with 10" buckets attached. 70 ft.
Also other sizes priced way below market.

Wanted: Conveyor Belting and Belt Conveyors All Sizes.

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55 West 42nd St. New York, N. Y.

PRICED FOR QUICK SALE

1—No. 13A Telsmith Crusher with manganese non-choking concaves, in excellent condition. . **$1650.00**
1—No. 8A Telsmith Crusher, manganese fitted, in excellent condition **$1200.00**
1—48" Symons Horizontal Disc Crusher (Nordberg Mfg. Co.), completely overhauled, rated capacity 1" product 45-60 T.P.H. **$1,000.00**
1—8" Allis-Chalmers Style N Gyratory Crusher, No. 7715, like new; used only for one season. Manganese fitted, non-choking concaves, smooth head for fine crushing, extra head for coarse crushing **$850.00**
1—No. 2 Allis-Chalmers Gyratory Crusher, manganese fitted **$250.00**
1—Allis-Chalmers Eccentric with manganese steel gear for No. 5 style K crusher, like new. **$150.00**
1—30"x16" Universal Crushing Rolls. **$1,150.00**
1—9"x20" Acme Jaw Crusher. **$285.00**
1—8"x30" Universal Jaw Crusher. **$500.00**
1—12"x32" Lippmann Roller Bearing Jaw Crusher **$1750.00**
Several Vibrating Screens, Bucket Elevators, Sand Classifiers, Electric and Gasoline Motors, 2", 3", 4", 6" Self-priming centrifugal pumps with gasoline motors; 1½", 2", 3", 4", 6" centrifugal pumps with electric motors.
Several Portable Air Compressors, on pneumatic tired wheels, 105 to 160 c.f.m. actual air, like new.
1—Link-Belt Shovel Boom Assembly with 1 yard Amsco dipper, excellent condition, will fit models K1, K2, K35, K42.
1—P&H ¾ yard Shovel Boom Assembly for Model 206.

LIPPMANN ENGINEERING WORKS
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VIBRATING SCREENS
Fully Reconditioned

4—4'x5' Type 33, Enclosed Hum-mers With or Without Generators.
1—40"x60" FB-2 Traylor Single Deck—With Generator.
1—4'x7' Single Deck Traylor Electric Conveyanscreen—With Generator.
1—40"x60" Mitchell Electric
2—5½'x6' Newaygo, Belt Drive—1, 2, or 3 Screen Surfaces.
1—8'x6½' Newaygo Type K—Belt Drive.
1—4'x6' Newaygo Shaking Screen—Belt Drive.
1—3'3"x10' Double Deck Mechanical Shaking Screen—Belt Drive.
1—3'x3' Impact Screen—Belt Drive.
1—30"x5' Link Belt—Belt Drive

Also an Assortment of Trommel Screens

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Bay City Model 24 heavy duty ½ yd. shovel. Excellent.
Bay City Model 24 dragline 22 inch shoes, nearly new.
Bay City Model R heavy duty ¾ yd. shovel and dragline, good condition.
Bucyrus-Erie 10B ⅜ yd. shovel and dragline. Repairs needed.

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14—CLEVELAND DR-8 (latest model) Universal Drill Rigs, with recoil device, for depth of 25 to 30 ft. with 6 ft. change, mounted on three rubber tires; with D-14 DR CLEVELAND drifter; recommended for use with 260 ft. or 315 ft. compressor. In excellent condition. Real buy. Can be inspected at our yard.

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8-B Telsmith primary crusher, high speed shafts and roller bearings. Good condition.
¾ yd. Brownhoist combination crane and shovel.
5 yd. Austin-Western rubber-tired scoop.

COOGAN GRAVEL COMPANY
805-b Lehmann Bldg. Peoria, Ill.

COMPLETE STONE CRUSHING
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SAND and GRAVEL PROCESSING SERVICES
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We will install NEW, MODERN portable or semi-portable plant in any practical location. Capacities 100 to 150 tons of stone per hour or 150 to 200 tons of sand and gravel per hour.
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Pioneer Portable Screening and Crushing Plant, jaw and roll crushers, rubber tires, 100 h.p. Waukesha power unit $6,500
Universal Portable 15 x 36 Primary Crushing Plant, adjus able feed apron, sturdy truck, 75 h.p. Hercules power unit. 3,300
Sullivan Portable Air Compressor, 110 cu. ft. capacity Buda power. 500

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30—Portable gasoline driven air compressors all makes—sizes 310′, 260′, 220′, 160′, 110′.

2—150′—10½″ C.C. Westinghouse steam air compressors.

BINS

12—1—150-ton Johnson, 3-comp.; 1—150-ton Blaw-Knox, 2-comp.; 1—120-ton Blaw-Knox, 4 comp.; and the following 2-comp. bins: 2—118-ton Blaw-Knox, 1—117-ton Blaw-Knox, 1—72-ton Blaw-Knox, 1—75-ton Butler, 1—51-ton Blaw-Knox, 1—35-ton Blaw-Knox, 2—30-ton Johnson offset bins—both with or without weigh batchers.

CONVEYORS:

1—18″x176′ Northern stationary belt conveyor, steel frame, motors, belt and catwalk.

10—Portable belt conveyors, gas or electric from 18″x28′ to 24″x53′ Barber-Greene, Burch, Northern, Stephens-Adamson and National.

1—18″x12′ Barber-Greene, style 51 belt feeder.

CRANES, DRAGLINES & SHOVELS

1—Link-Belt, K-55, Serial No. 1698, 70′ boom, 2 yd. bucket, also have 2 yd. shovel attachment.

1—Link-Belt K-48, Serial No. 1728 with 60′ boom 2 yd.

1—Northwest Model 5, Serial No. 3572 with 50′ boom, 1½ yd.; also pull shovel 1¼ yd. and

2—Northwest Model 4, Serial Nos. 3441, 3445 with 40′ boom 1 yd.; also 1-yd. pull shovel.

1—Northwest Model 104, Serial No. 2079, 45′ boom, 1¼ yd. bucket; with 1 yd. shovel attachment.

1—Link-Belt, Model K-42, Serial No. 1265, 45′ boom, 1¼ yd. bucket, also 1 yd. trench hoe attachment or 1¼ yd. shovel front.

2—Northwest Model 105, Serial Nos. 2556, 1645, 40′ boom, 1 yd. bucket with one shovel attachment.

2—Osgood Heavy Duty, Serial No. 2069 and No. 2087, 40′ boom, 1 yd. bucket and with 1 yd. shovel attachment.

1—Thew, ¾ yd. Gasoline Shovel with ¾ yd. shovel front and 40′ crane boom. Serial No. 2801.

2—Koehring Model 301. Serial Nos. 544 & 772, 40′ boom ¾ yd. bucket.

1—Northwest No. 2 crane, new 1937 with 40′ boom.

1—Byers Bearcat Model 27, Serial No. 5289. 30′ boom, ½ cl. sw., ½ yd. bucket.

1—Erie Steam Crane & Shovel with 40′ crane boom, with or without ¾ yd. shovel front.

CRUSHERS

5—Gyratory crushers: 1—No. 5 Allis-Chalmers; 1—No. 5 Austin; 1—No. 5 Gates; 1—No. 3 McCully; 1—No. 0 McCully.

10—Jaw Crushers: 3—15x36″ Universal; 1—15x36″ Cedar Rapids; 1—15x26″ Champion; 1—12x20″ Acme; 2—10x20″ Climax No. 2½; 1—9x16″ Telsmith No. 9A; 1—9x15″ Champion.

1—Set of Allis-Chalmers, smooth type crushing rolls, 42x16″.

DERRICKS

3—steel Guy Derricks; 1—15 ton Terry, 115 ft. mast, 100′ boom, 1—10 ton American, 115′ mast, 100′ boom, 1—6 ton Bedford, 90′ mast, 80′ boom.

6—steel stiff leg; 1—25-ton just, 77′ boom, 1—18 ton Double, 75′ boom, 1—15 ton just, 65′ boom, 1—15 ton Clyde, 50′ boom, 1—10 ton Insley, 80′ boom.

HOISTS

1—2 Yd. Thomas 2 speed Class L Cableway excavator hoist with 150 HP electric motor.

1—National 50 HP dragscraper hoist for handling 1 yd. bucket with 50 HP electric or gas power.

1—1 Yd. Cedar Rapids 2 speed dragscraper hoist with 50 HP electric or gas power.

1—1 Yd. Kern variable speed dragscraper hoist powered by 50 HP electric motor.

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DRAGLINES—LOCOMOTIVES

1—Model 800 P&H Dragline or Crane, Atlas Diesel engine, 80′ boom, 2¾ yard bucket, long crawlers. Fine shape.

1—Model K - 480 Link - Belt Dragline or Crane, D 17000 Caterpillar Diesel Engine, 75′ boom, 2½ yard Page bucket. Used one year and completely overhauled.

1—Model K-480 Link-Belt Dragline or Crane, 7x7 Hesselman oil engine, 75′ boom, 2 yard heavy Page bucket, Serial 1689. Overhauled.

1—Model 95 Lorain Dragline or Crane, D 13000 Caterpillar Diesel engine, 70′ boom. 2 yard Page bucket. Completely overhauled.

1—Model 75A Lorain 1¼ yard Gas Shovel, Serial No. 4137. Good working order.

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4—Class 36—40 Ton 36″ Gauge Heisler Geared Locomotives. Good condition. A.S.M.E. boilers.

1—Model FD 14 Allis-Chalmers, 108 H.P. Angledozer. Used 3 months.

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1—Universal (Lorain) Model 35½ yd. shovel-crane No. 1280.

1—Northwest No. 25⅛ yd. comb. crane and backhoe

1—Bucyrus-Erie GA-2 Shovel No. 4046. Cheap.

1—General Diesel Backhoe, No. 1847, late model.

1—Northwest No. 105 1 yd. gas crane No. 2249.

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1—Chicago-Pneumatic, Type VC, 664′ Diesel Compressor. Like New—Cheap.

1—Whitcomb 6 ton Locomotive, 24″ ga.

2—Gardner-Denver 437′ Diesel Compressors, 1939.

1—Ingersoll-Rand, 310′ Single Stage, Portable Compressor.

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1—Terry 25 ton Stiff Leg, 90′ boom, bucket operating.

1—Flory 10x12, 3 Drum Steam Hoist with Separate Swinger and Banked Levers.

1—Sauerman ¾ yd. Drag Scraper, complete with cables.

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21—CP No. 5 Drifters, Complete with shells and screws. $75.00 each. Money Back Guarantee.

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1—Madsen 1000 lb. asphalt plant with dryer.

1—1-yd. complete central mixing plant comprising 150-ton Heltzel bin, 1-yd. mixer, bucket elevator—electrically driven—will sell all or part.

1—8-ton standard gauge Whitcomb gas locomotive 850.00

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1—Couch 4000 GPM dewatering pump without power 500.00

1—Couch 2700 GPM dewatering pump without power 250.00

1—No. 2 Northwest combination crane and shovel—fine condition..... 4000.00

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One No. 3 Schaeffer Continuous Hydrator complete with Poidometer and motor. Fitted with Kuntz Dust Control. Entirely reconditioned.

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PRICED WAY BELOW MARKET

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Immediate shipment from stock.

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1—No. 9 McCully Gyratory Crusher, Manganese fitted, together with sheaves, idler, shafts, bearings and spare parts. Rebuilt for tough going—good working condition.

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No. 80 Austin Western Portable Crushing and Screening Plant 36x60″ Fairmount Single Roll Crusher.
Superior 13, Kennedy 19, 25-8, 37, Allis-C. 6 & 9 Gyratory Crushers.
18x38 Austin, 36x24 Farrellaw 18x24″ Sel. Roll.
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2—6x12′ Ball Mills, Silex Lined with balls.
Barber-Greene Loaders, 25 42 & 82. Also Haiss, Link-Belt.
One yard Northwest Gas Crawler Crane 35′ boom.
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Diesel, Nat. Gas & Steam Engines, with & without gens.

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108 ¾ yd. shovel and dragline complete, trailer optional $4500.00. Good as new. Latest model.

Rebuilt Byers ¾ yd. shovel, 45,000 lb., New 80 H.P. Waukesha engine, perfect, $3,750.00.

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In stock for immediate shipment new 1¼″ round wagon drill steel with lug shank for Timken bits.

64 pieces — 6 ft.
2 " —10 ft.
80 " —12 ft.
1 " —14 ft.
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Offered subject prior disposition at special prices to close out overstock. Please state quantity and sizes desired.

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All sections new and relaying rail, spikes, bolts, frogs, switches, "Y" Shaped, flat and Contractors' Cars, etc. Prices cheerfully quoted.

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DEPENDABLE USED MACHINES

Bucyrus-Erie 10-B shovel; 1928 model.
½ yd. dragline with bucket; good cond.
Several ½ yd. clamshell buckets.
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Pioneer 2436 roller bearing crusher.
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OLIVER FILTERS
4—Oliver Rotary Continuous Filters, 8'x10', wood stave, closed steel head, steel trough, oscillating agitator, reduction gear drive, no motor, complete with receivers, pumps.

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36" Allis-Chalmers Style "N," short shaft; 42" Gates; 20" Kennedy Gearless; 20" Traylor; 20" Allis-Chalmers Superior McCully; 15" Telsmith; 13" Superior McCully and smaller sizes.

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1'8" and 2'4" Traylor TY; 410-TZ, 4' Traylor; No. 19, 25, 37 and 49 Kennedy.

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30x42" Buchanan Type "C"; 48x42 Traylor Bull-dog; 66x86 Traylor; 48x60 Traylor; 36x24 Farrel; 18x36 Farrel; 24x36 Allis-Chalmers; 8x36 Universal Roll Jaw; 18x30 Allis-Chalmers and smaller sizes.

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8'x125', 8'x110', 6'x120', 6'x60'.

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Ruggles-Coles, double shell: 5'x26', 5'x30', 5'6"x60', 80"x45', 104"x60'; 104"x85'. Single shell: 4'x 30', 5'x30', 6'x40', 6'x50', 6'x60', 8'x60', 8'8" x85'.

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4'x20' Indirect Heat Rotary Dryer.
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Belt Conveyors, Bucket Elevators, Steel Storage Tanks, Pumps, Air Compressors, etc.

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Hardinge straight side Rod Mills, iron lined, herringbone steel gears, enclosed gear drive units, change of rods with each mill. Arranged for peripheral or trunnion discharge. In excellent condition and for immediate shipment.

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Ball Mills: 3'x5', 5'x10', 6'x6', 6'x8'.
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2, 3 and 4 roll High Side; Nos. 0000, 00, 1 and 3, Beater type—also Nos. 55, 60, 90 Imp type, also No. 40 Imp with 6' Centrifugal Separator.

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2—Sullivan Type WN-102, two stage, 550'. New 1939.
2—Ingersoll-Rand 90-CH, two stage, air cooled, electric driven, on skids, 360 CFM, 1939.
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10' Sturtevant; 8', 10', 12' Gayco; 6' Raymond; also 5' dia. Raymond "Whizzer" for attachment to roller mill.

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Weber type, made by Arnold & Wiegel with No. 1 Raymond Bros. Lime Separator; also Kritzer.

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No. 17 Clyde Whirley with 105' boom, new 1938. Oil fired, enclosed cab. Excellent condition.

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Wire your orders, for both these items are selling fast. Deduct 5% if check accompanies order.

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1—Lorain-77 Diesel Shovel 1½ yd.
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Swing Hammer Mills.
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Direct Heat Rotary Dryers—3½'x25', 4'x30', 5'x30', 5½'x40', 6'x50', 7'x50' and 8'x50'
Semi-indirect heat Dryers—5'x30' and 8½'x 75'.
Cement Kilns—3' up to 8' diameter.
Hardinge, Marcy & Fuller-Lehigh Mills.
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2—6'x12' and 1—4'x10' rod mills.
Tube—Rod and Ball Mills—3' to 6' diameter.
Vibrating Screens—Air Separators.
1—4'x4' and 8'x6' ball mills.
New Dryers built for all purposes.

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all in excellent condition

8 inch x 8 inch Road Forms
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Jaeger Lakewood Road finishers type G.
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Well Point Systems—Service From Coast to Coast. Other Bargains—in Pumps, Building Mixers, etc.

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Northern Blvd. at 127th St., Corona, L.I., N.Y.

Phone Newtown 9-7777

NEW AND USED EQUIPMENT

IMMEDIATE DELIVERY

All used items have been re-conditioned and are guaranteed

One (1) 9"x16" bronze bearing DIAMOND jaw crusher complete with flywheels and Model P2877D2 LeRoi motor mounted on trailer unit with steel wheels. (Power: 16-26 HP. 4 Cylinder @ 900-1500 RPM)	New
Two (2) Pitman assemblies with SKF bearings including main bearings for 10"x20" jaw crusher	New
One (1) bucket elevator 32'0" centers, rigid type, with buckets 12"x6"x7¾" mounted on belt	New
*Three (3) Pitman assemblies for 10x20 jaw crusher, bearings SKF type	Slightly Used
*Three (3) 10x36 Pitman assemblies for 10x36 jaw crusher	Rebuilt
*One (1) 15x36 Pitman assembly complete	Rebuilt
One (1) 20'0" bucket elevator with buckets 10"x6"x7¾" mounted on chain	Rebuilt
One (1) 30"x10'0" double shaker screen	Slightly Used
One (1) Grizzly and hopper 6'8x6'8 with 5" sq. opgs. and 20"x3'0" plate feeder	Good Condition
Two (2) Quarry plants with 10x20 anti-friction brg. jaw crushers and folding type bucket elevators size 12x6x73¼"x 25'0" mounted on trucks with four steel wheels	New
Two (2) 30 cubic yard bins, 3 compartment with jack legs	New
Six (6) Steel wheels 40" dia. x 16" face to take 4" Hyatt bearings	New
Four (4) Steel wheels 40" dia. x 10" face to take 4" Hyatt bearings	New
Four (4) Steel wheels 28" dia. x 4" face bore 1¾"	New
Ten (10) Steel wheels 28" dia. x 5" face, bore 1 15/16"	New
Eight (8) Steel wheels 24" dia. x 3½" face, bore 1⅞"	New
Four (4) Steel wheels 28" dia. x 14" face, bore 4" Hyatt	New

POWER UNITS

One (1) U-40 Allis-Chalmers Gasoline Power Unit @ 36 Cont. HP @ 1200 RPM	Rebuilt
One (1) W-25 Allis-Chalmers Gasoline Power Unit @ 25 HP @ 1300 RPM	Rebuilt
One (1) Model 300 International Power Unit, Max. HP 56 @ 1050 RPM	Used

* The above Pitman assemblies can be installed in new bases and sold as complete machines.

DIAMOND IRON WORKS, INC. and MAHR MANUFACTURING COMPANY DIV.
Minneapolis Minnesota

SURPLUS EQUIPMENT

AIR COMPRESSORS, 2-Stage with Motor
3—IR Imp. Type 10, cap. 600 cu. ft.
1—Sullivan WN-31, cap. 982 cu. ft.

BOILERS, Kewanee Steam Heating
1—2300 sq. ft. Type 750C.
1—2090 sq. ft. Type No. 83R6 with Oil Burner.

ELECTRICAL EQUIPMENT
3—300 KW, 600 V GE Rotary Converter.
1—300 KW, 600 V GE Switchgear (new).
3—300/450 KVA GE Transformers 22,000/445 V. 15, 25, 30, 50 & 200 HP. Electric Motors.

HOISTS
1—60 HP. Sauerman, PTE DD.
1—37 HP. Natl. 48 x 42 SD.
5—20 and 25 HP. Tuggers.
1—75 HP. Ottumwa 48 x 36.
1—100 HP. Ottumwa 54 x 78.

LOCOMOTIVES, Steam, Std. Ga.
3—50-Ton Std. Ga. Steam Baldwin.
2—60-Ton Std. Ga. steam Baldwin.

PUMPS
1—1,000 GPM 325' Hd. Cent.
4—4" Dorrco Diaphragm
2—3,000 GPM Deep Well.
1—1,000 GPM Deep Well.
1—1,650 GPM 2-Stage A-C.
3—Steam Pumps.

WAGONS, Crawler
10-Yd. Patt. Side Dump.
16-yd. Athey 2-Way Side Dump.

BUCKET ELEVATORS: Steel 320 Ton Cap.
CONVEYORS: Goodman A&B Shaker
CRANES: 2—20-Ton Loco. Type.
CRUSHER: 2' Coarse Cone Std. Hd.
GOLD MACHINE: Ainley 4-Bowl.
JACK HAMMERS: RB 12 Auger L.H.
JIGS, ORE: 2-Cell Bendelari & Wood.
ROD MILL: Marcy 4 x 10 RH.
SCREENS, Revolving: 5'x8' Trommel.
SHOVEL: 3½-Yd. Diesel on Cats.
TRACK SCALE: 28' Rail 100-Ton Cap.
TRACKSHIFTER: Std. Ga. Model N.
WATER TANK: 10,000 Gal. Steel.

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PRODUCERS OF IRON ORE
137 East 8th St. St. Paul, Minn.

Bucket Elevators:
Encased—Continuous—Spaced.
24"x60', 20"x40', 16"x60', 14"x50', 14"x32', 12"x35', 10"x35', 8"x32', 7"x32', 5"x32'.
Chain, Belt, Buckets, Sprockets, Casings.

Railway Equipment:
36" Whitcomb 8-ton & Vulcan 4-ton Locomotives.
8—36" Koppel 3-yd. V-type Dump Cars.
2—30" Mercury 2-ton Battery Locomotives.
12—24" Koppel 1-yd. V-type Dump Cars.
5—24" Easton 1¼-yd. V-type Dump Cars.
5—24" Koppel ¾-yd. V-type Dump Cars.
6—24" Atlas ½-yd. End Dump Cars.
24" Portable Track and Switches, 1500'.

Vibrating Screens:
3'x4' 1-deck Leahys. 4'x5' 1-deck Hummers.
3'x5' 1-deck Multirap. 4'x6' 2-deck Leahys.
3'x5' 1-deck Hummers. 4'x7' 1-deck Hummers.
3'x6' 1-deck Leahy. 4'x10' 2-deck Jigger.
3'x6' 2-deck Leahy.
V-16 and V-32 Hummer Vibrator Heads.

Crushers:
Jaw—36" x 24", 24" x 13", 20" x 10", 18" x 12", 16"x9", 15"x9", 10"x4".
Gyratory—2 37 & 2 25 Kennedy & 8" Traylor.
Roll—54"x20", 42"x16", 36"x16", 24"x24".
8'x54" Bonnett Ball Mill with Air Separator.
36"x24" Jeffrey Type B New Hammermill.
Pennsylvania Hammermill, 40-hp. Late Type.
Ross Chain Crusher Feeder.

Belt Conveyors:
18"x44' and 20"x45' Portable Types.
12" to 36" wide Gravity Roller Sections.
Feeders—24"x11' and 36"x5' Apron Types.
14" to 36" wide Rubber Belt and Cast Pulleys.
Gears, Take-Ups, Bearings, Collars, Shafts.

Miscellaneous:
⅝-yd. Byers Gas Shovel, with Crane Boom.
Clamshell Buckets—½, ¾, 1¼ and 1½-yard.
10 Centrifugal Water Pumps, gas and electric.
800-hp. Patterson Hot Water Feed Heater.
50-ton Blaw Knox Batching Bin, 2-compartment.
Gas Engines, Electric Motors, Gear Reducers.

G. A. UNVERZAGT, 15 Park Row, New York City

LOCOMOTIVES SHOVELS—CRANES

CARS

1—50 ton American Saddle Tank A.S.M.E. Boiler
1—40 ton Porter Saddle Tank, new firebox in 1940
1—32 ton Porter Saddle Tank, rebuilt

15—Modern Covered Hopper Cement Cars

1—17½ ton Brownhoist Steam Loco. Crane, New A.S.M.E. Boiler
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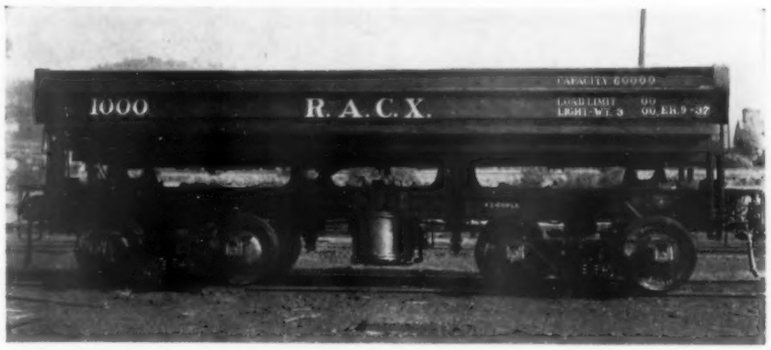
1—1½ Yd. Rehandling Clamshell Bucket, Like New

Birmingham Rail & Locomotive Co.
BIRMINGHAM, ALA.



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13—Kilbourne & Jacobs 16 cu. Yard air operated Dump Cars, fully rebuilt and available for immediate inspection and delivery, quotations and prints gladly furnished.

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Practical Quarry Engineer who has managed Quarry and Crusher plants from 500 tons daily capacity up to large Quarry using big blast hole drills with Crusher plant having 7500 tons daily capacity, desires position as manager or Superintendent. Address

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2—1300 to 1500 Ft. Air Compressors.
1—Locomotive Crane.
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1—36x48 or Larger Jaw Crusher.
1—Suitable Cone Reduction Crusher.

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One No. 5 Allis-Chalmers Gyratory Crusher, in first class operating condition.

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ROCK CRUSHERS portable and stationary. 5 to 200 Tons per hour capacity.
REPAIR PARTS for all Acme Road Machinery Company products.

ACME ROCK MACHINERY CORPORATION
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7—Electric Locomotives.
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All in A-1 Condition, and Ready to Go. Complete Information, Prices and Terms.

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3½-yd. P&H diesel, crawler.
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NEW RAILS—5000 tons—All Sections—All Sizes.
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Whitcomb 12 ton Gas Locomotives, 36" ga.
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30" Belt Conveyor Equipment 220 ft. including Merrick Weightometer and five motors. Capacity 200 to 250 T.P.H. Good Condition.

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2—1½ yard (old rating) 1937 Jaeger truck mixers with Hercules engine drive—14" steel sills—mounted on dual pneumatic MH45 1937 Dodges, equipped with Eaton 2-speed axles.

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One Chicago Class NSS, 8 x 9 x 8, Horizontal, Single Stage, Simplex Valve, No. 18884 direct steam driven Air Compressor, 173 cubic ft. capacity. Built by Chicago Pneumatic Tool Company.

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(1) 240 cu. yd. G-D Portable Compressor, rebuilt, late type $1000.00
(1) Model 44-Marion 1 yd. combination shovel-dragline. Gasoline caterpillar..... $1750.00
(1) ½ yd. Byers combination shovel-dragline $1000.00
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(1) 8x36 and 15x36 Universal Steel Crushers.
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Gasoline Engine, 120 HP., 4 cylinder 8½x10" bore, 450 RPM, mounted on frame with clutch and pulley.
One ¾ yd. steam Erie Type B Combination shovel and crane, 45 ft. boom with ¾ yd. clam bucket, also fair lead attachments for drag buckets.

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Partial Stock List

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Quantity	Width	Ply	Type Cover	Bottom Cover	Type
500 Ft.	48"	8	1/8"	1/16"	Conveyor
505 Ft.	36"	6	1/8"	1/16"	Conveyor
856 Ft.	30"	6	1/8"	1/16"	Conveyor
529 Ft.	30"	5	1/8"	1/16"	Conveyor
180 Ft.	24"	6	1/16"	1/16"	Elevator
2305 Ft.	24"	5	1/8"	1/32"	Conveyor
1298 Ft.	24"	4	1/8"	1/32"	Conveyor
250 Ft.	22"	8	1/16"	1/16"	Elevator
1874 Ft.	20"	5	1/8"	1/32"	Conveyor
520 Ft.	20"	4	1/8"	1/32"	Conveyor
506 Ft.	18"	6	1/16"	1/16"	Elevator
1765 Ft.	18"	4	1/8"	1/32"	Conveyor
285 Ft.	16"	6	1/16"	1/16"	Elevator
1450 Ft.	16"	4	1/8"	1/32"	Conveyor
516 Ft.	14"	6	1/16"	1/16"	Elevator
509 Ft.	14"	4	1/16"	1/32"	Conveyor
420 Ft.	12"	6	1/16"	1/16"	Elevator
385 Ft.	12"	4	1/16"	1/32"	Conveyor

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BELTED: 355, 528, 676, 1000, 1300 & 1570 Ft.
ELECTRIC: 478, 676, 807, 1302, 1722 & 2850 Ft.
DIESEL: 105, 315, 420, 603, 807 & 1000 Ft.
PORTABLE GAS: 110, 160, 220, 310, 540 & 1300 Ft.
STEAM: 49, 310, 528, 1300 & 2200 Ft.

BUCKETS
50 Skips and Battleship Type, 2 to 6 Yds.
3 Owen & Bucyrus Rock Grabs.
CLAMSHELL: 1/2, 3/4, 1, 1 1/2 & 2 Yds.
ORANGE PEEL: 3/4, 1, 1 1/2, 2 & 3 Yds.
DRAGLINE: 1/4, 3/4, 1, 1 1/2 & 2 Yds. Cap.

CRANES & DRAGLINES
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12 Ton NORTHWEST 50 Ft. Boom Gas.
12 Ton KOEHRING 45 Ft. Boom Gas.
16 Ton Speedcrane, Gas, 50 Ft. Boom.
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1 1/2 Yd. BUCYRUS 41B Steamer.
1 1/2 Yd. Lima 750 Diesel.
1 1/2 Yd. KOEHRING 601—Gas.

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3—1000 gal. ETNYRE Mack.

DUMP CARS
46—KOPPEL 1 1/2 Yd., 24 & 30 In. Ga., V Shaped.
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6x8 Continuous Pebble Mill.
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4x16 Smidth Tube Mill Silex.
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14 ft., 8 ft. and 12 ft. Separators

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36x60 Fairmont Single Roll.
36x20 Diamond Double Roll.
24x24 & 36x16 & 36x20 Diamond Double Roll.

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18 in., 24 in., 30 in., 36 in. and 48 in. Symons Disc.
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4—10 TZ Traylor 4 Ft. Gyratory.
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10 Inch Austin Model 105.
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16" Traylor.
7 Ft., 5 Ft. and 3 Ft. Symons Cone.

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29T ARMSTRONG Well Drill.

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400 Bbl. Portable BUTLER Bulk Cement Bin with Fuller Full Automatic Electric Push Button Weigh Batcher.

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100 K.W. RIDGWAY 3/60-2200-250-275 volt.
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200 K.W. RIDGWAY 3/60-2200-250-275 v., 900 rpm.

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125 K.W. F.M. 250 v. D.C.

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5 Roll High Side.

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LOCOMOTIVES
DIESEL: 7—41/2, 8 and 15 Ton 36 & 42 In. Ga.
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30" Reciprocating Plate Feeder.

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12—50 Ton Cap. Battleship Gondolas.
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1—3/4 yd. Gas 1—1 1/2 yd. Electric
1—1 yd. Electric 3—2 yd. 3 yd. & 4 yd. Electric

42 IN. BELT CONVEYOR
350 Ft. Barber-Greene Sectional Steel Frame Roller Bearing Belt Conveyor. New 1939.

JACK HAMMERS AND DRIFTERS
21 Worthington 169 Drifters.
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125 Ton 56' x 10'6" Platform 4 Section.

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5 Clyde 75 to 100 ft. Boom.

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96 H.P. Waukesha Hesselman.
2—370 H.P. Chgo. Pneu. RHA4SS, 360 rpm.
420 H.P. Sulzer, 1000 rpm.
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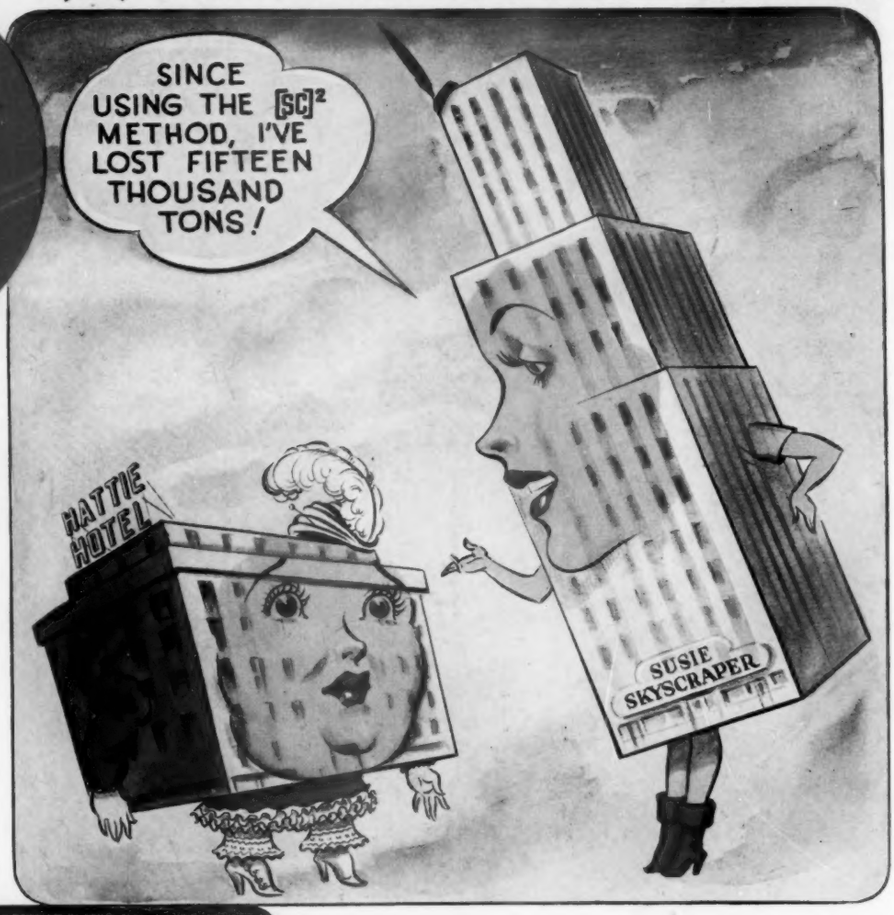

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